2024 International Conference on Industrial Engineering, Applications and Manufacturing (ICIEAM 2024)

Sochi, Russia
20-24 May 2024

Pages 1-610

IEEE Catalog Number: CFP24F42-POD
ISBN: 979-8-3503-9502-0

Copyright © 2024 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: CFP24F42-POD
ISBN (Print-On-Demand): 979-8-3503-9502-0
ISBN (Online): 979-8-3503-9501-3

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

TABLE OF CONTENTS

Resource-Saving Current Protections for Electrical Installations 1
Dauren D. Issabekov, Olzhas M. Talipov

Structure and Sizing Optimization of a Multi-Energy System with Local Energy Sources 12
Oleg Yu. Maryasin, Artem Plohotnyuk

Pre-Breakdown Condition of Insulation Recognition by Partial Discharges Characteristics 18
A. M. Gataullin, D. F. Gubaev, R. V. Gataullina

Analysis and Calculation of Damage from Power Line Failures in Urban and Rural Power Grids 24
Yu. N. Kondrashova, A. M. Tretyakov, A. V. Shalimov

Assessment of Reliability and Efficiency of Power Supply Schemes Taking into Account the Factors of Short-Term Power Supply Disruptions 29
Ilgiz F. Galiev, Shamil R. Yakhin, Marsel Sh. Garifullin

Localization of Insulation Defects in High-Voltage Equipment Using the Visual-Acoustic Method 36
Dmitry A. Ivanov, Tatyana G. Galieva, Aidar I. Vagapov

Increasing the Sensitivity of Current Protection of Distribution Networks 6–10 K V Based on Linear Voltage Measurements 42
N. N. Kononova, M. D. Krasko, V. V. Bezin

Cyber-Physical Microgrid: Development Trends, Digitalization Directions, Management Features 47
Liudmila Gurina, Tatsiana Zoryna

Methodology for Designing a System of Nondestructive Testing of the Technical Condition of Substation Equipment Insulation Based on the Solution of the Problem of Localizing the Discharge Sources 53
Danil Yaroslavsky, Van Vu Nguyen, Nikolay Andreev

Method for Calculating Efficiency of Distribution Transformers Using Semi-Constant Coefficients and Taking into Account Interdependence of Its Parameters and Magnitude and Nature of Load of Power Supply Facility 60
Sergey S. Kostinskiy

Fast Automatic Transfer Switch with Energy Storage 70
Andrey P. Chervonenko, Denis A. Kotin, Georgii S. Sidorov

Rationale for Use of Grade I - III Distribution Transformer Efficiency Calculation Technique Taking into Account Correlations Between Their Parameters and Amount and Type of Power Supply Load 76
Sergey S. Kostinsky

Resistor-Thyristor Geoinduced Current Protection for Power Transformer 87
Aleksey Kuvshinov, Julia Chernenko, Oleg Fedyai

Digital Protection of Electric Motor 92
O. N. Kuzykov, E. P. Vlasova

Integration of a DC-Based Power Supply System into a Residential 97
Artem Kudryavtsev, Ivan Pavlov, Violetta Zatsepina

The Limits of the Efficiency of the Pyramid Sorting Algorithm for Energy System Indicators 102
A. I. Vlasov, K. V. Selivanov, M. M. Tsarev

Processing Signals in Digital Current Measuring Transformers to Quickly Obtain the Vector for RPA Purposes 114
Vladimir D. Lebedev, Denis G. Grigorev, Nataliya V. Kuzmina

Investigation of the Use of Rogowski Coils for Power Direction Relays in Fast Automatic Bus Transfer 124
Aleksey Evdakov, Andrey Yablokov, Galina Filatova

Selecting the Setting Parameters of Device Instability Prevention Automation Using the Example Local Automatic of Distribution Center 330 kV Kamennyj Bor 130
Denis Petrushin, Matvei Mikheev, Alexandra Bolshakova

Interaction of Prosumers Cooperating in an Integrated Energy System 136
Evgeny Barakhtenko, Natalia Aizenberg, Gleb Mayorov

Algorithm Application of Machine Learning Algorithms to Predict Energy Demand 141
M. K. Arabov, A. F. Nazipova, R. A. Burnashev

Fault Location and Monitoring of Open Phase Conditions on 500 kV Transmission Lines with Synchrophasor Measurements 146
Igor Ivanov, Yaroslav Umnov, Anastasya Kraykina

Algorithm of Automatic Tuning for Ground-Fault Neutralizer in Distributing Mains 152
Dmitry S. Osipov, Alexander G. Lyutarevich, Vsevolod A. Tkachenko

Development of Regulatory Requirements for Calculation of Electrical Loads of Residential Complexes 158
Alexander Fedotov, Azat Akhmetshin, Viktor Kulakov

Development of Regulatory Requirements for Calculation of Electrical Loads of Schools and Kindergartens 163
Yuri Soluyanov, Azat Akhmetshin, Vladimir Khalturin

Research of the Capacitor System of the Electric Starter Starters for Internal Combustion Engines 168
R. A. Maleev, E. A. Ryabykh, Y. M. Shmatkov

The Use of the Received Signal Strength Indicator (RSSI) as a Way to Register Partial Discharges 173
Tatyana Galieva, Marat Sadykov, Alexander Lyubishchev

Maintaining Reliable Operation of Isolated Power Districts with Industrial Loads Through Use of Hybrid Power Storage Systems 179
Pavel Ilyushin, Sergey Shavlovskiy, Sergey Filippov

Studies of a Traction Electric Drive with a Combined Energy Storage Device 185
Egor Klimov, Ruslan Maleev, Alexey Filin

Analysis of the Requirements of Technical Standards for Grid-Connected Distributed Power Sources 190
Liqun Guo, A. G. Vaskov

Increasing the Stability of a Plant When Supplying Power to a Variable Load 196
Olga V. Gazizova, Aleksandr E. Morshchakin, Danil A. D'Yakov

The Optimal Cross Sections Method of Choosing the Conductors 35–220 kV of Power Supply Networks 201
Aleksandra V. Varganova, Dmitry A. Petrov, Danil O. Pozin, Elena S. Chizhikova

Innovative Technologies for Utility Power System 208
Elizaveta Iyanova, Felix Byk

6(10) kV Reclosers Location Selection Method to Increase the Consumer Power Supply Reliability 213
Ruslan Rachmatullin, Timur Musaev, Oleg Fedorov

Research of the Wind Asynchrony Impact on the Efficiency Indicators of the Wind Power Complex in the Rostov Region 218
Tatyana Shestopalova, Galina Deriugina, Evgenii Ignatev

Maintaining Improving Control Response of Generators at Conventional Power Plants for Power Systems with Integrated Wind and Solar Power Plants 224
Pavel Ilyushin, Igor Georgievsky, Ekaterina Boyko

SIMINTECH-Based Computer Modeling for Solar Power Plant 230
Evgeni A. Denisenko, Nikolay S. Barakin, Andrey V. Kvitko

Method of Desalination of Seawater in a Solar Collector 235
Mikhail Lemeshko, Alexsander Lemeshko

Assessing the Reliability of Small Hydropower Plant Generation Systems Using Markov Processes 240
Igor Kovalenko, Vyacheslav Kozhemyakin, Vladimir Tremyasov

Development of Hardware Module for Collecting Parameters of Microhydroelectric Power Plant Operation in Mountainous Conditions 245
Stefan V. Onishchenko, Aliy R. Mamiy, Konstantin A. Yurkaev

Energy Efficiency of Using Heat-Reflecting Screens with Solar Photovoltaic Panels in Windows 250
Grigory I. Parfenov, Nikolay N. Smirnov, Vladimir V. Tyutikov

Implementation Assessment of Tracker Installations in Solar Power Plants Under Conditions of the Russian Far North 255
Nikolay Mestnikov, Ahmad Alzakkar, Yuri Samofalov

The Influence of Ambient Temperature on the Functioning of a Photovoltaic Installation in the Northern Part of the Russian Far East 261
Nikolay Mestnikov, Ahmad Alzakkar, Yuri Samofalov

Study of Using Photovoltaic Solar Installations Inside a Dome Structure Under Conditions of the Russian Far North 266
Nikolay Mestnikov, Ahmad Alzakkar, Yuri Samofalov

Wind Turbines Wake Models Comparison 271
Galina Deriugina, Evgenii Ignatev, Dmitry Kornev

Impact of a Partial Solar Eclipse on Electricity Generation 277
Ksenia Andreeva, Anastasia Vasileva, Victor Kharitonov

The Concept of an Autonomous Microgrid Powered by Renewable Energy Sources 288
M. I. Malsagov, G. R. Titova

Analysis of Wind Potential of the Republic of Dagestan and Energy Characteristics of the Caspian Sea Coastline 294
Temirkhan Isaev, Ruslan Tsgoev

Hybrid Solar-Based Power Supply for a Stacker Crane System 299
Haider M. Jassim, Mikhail Mudrov, Anatolii Zyuzev

Development of an Active Filter Control Program for Improving the Power Quality of Smart Grids 305
Aleksei V. Vyngra, Boris A. Avdeev

Improving the Power Quality at the Input of a Solid-State Transformer Using a Power Factor Correction 310
Boris A. Avdeev, Alexei V. Vyngra, Vyacheslav A. Sobolev

Short-Circuit Current Limitation 315
Oleg V. Vorkunov, Lyubov A. Glotkina, Alexey M. Sinicin

Analyzing Impacts of Higher Harmonics on Electricity Quality Parameters at Mining Facilities 321
Alexander S. Semenov

A Software Designed to Generate Transistor Models with Interconnections 326
Timur I. Tretyakov, Ilya I. Nikolayev, Anastasia A. Drozdova

Influence of Conductor Arrangement on Different Layers of the Printed Circuit Board Under Its Exposure to Electrostatic Discharge 331
Ksenia N. Abramova, Anastasiya A. Drozdova, Maxim E. Komnatnov

Simulation Modeling of a Booster Transformer Operation in the Railway Traction Power Supply System 337
Aleksandr Komyakov, Viktor Tarasevich, Lubov Bartel

Study of Electromagnetic Compatibility of a Voltage Sensor Based on a System of Galvanically Coupled Bodies with a Wireless Energy Transmission System 342
V. M. Zavyalov, A. S. Velilyaev, N. N. Smoktal

Analytical Model for Evaluating Shielding Effectiveness of an Enclosure with an Aperture Covered by a Metal Plate 347
Anton A. Ivanov, Nikita Ju. Shajmanov, Maxim E. Komnatnov

Combined Model for Calculating Resistance Matrix for Signal Integrity Analysis Considering Losses in Transmission Line Conductors 352
Aleksey A. Kvasnikov, Aleksandr E. Maksimov, Anton A. Ivanov

Verification of Computer Simulation of Temperature Influence on Microstrip Line Characteristics 358
Indira Y. Sagiyeva, Bakhtiyar E. Nurkhan, Talgat R. Gazizov

A Physical Model for the Study of Losses in Networks Up to 1000V, Taking into Account Harmonics with Different Modes of Operation of Neutral Power Transformers 363
Andrey A. Ivanov, Sergey V. Kakaurov, Ivan F. Suvorov

The Influence of Asymmetry on the Appearance of Combinational Pulses in Transmission Lines with Inhomogeneous Dielectric Filling 368
Evgeniya B. Chernikova

Protecting the Engine Speed Controller Board of UAV Against Conducted UWB Pulses 374
Alexander Kornev, Dmitriy Petukhov, Anton Belousov

Estimation Economic Damage and Efficiency of Electrical Equipment Taking into Account the Higher Harmonics at the Mining Enterprise 380
Yu. N. Kondrashova, A. M. Tretyakov, A. V. Shalimov

Method for Quality Control of Electronic Equipment Units Assembly Based on the Analysis of the Contact Radio Interference Level 386
Boris Utkin, Nikolay Grachev, Mikhail Utkin

Evaluation of the Efficiency of Conductor Placement Under Different Types of Pulse Interference in Differential and Common Modes 392
Alexandr M. Lakoza, Valerii P. Kosteletskii

Prediction of the Magnitude of Lightning Impulse Interference in an Electronic Device Using an Artificial Neural Network 398
Zinnur Gizatullin, Ramis Mubarakov

Mathematical Model to Define Electric Capacity of Transient Region of Electrical Contacts 403
E. S. Lyuminarskaya, S. E. Lyuminarsky, I. E. Lyuminarsky

Ensuring the Required Voltage Level for Consumers of the Circum-Baikal Railway Section 408
E. Yu. Puzina, I. A. Khudonogov, M. I. Krapivin

Complex Analysis of IEMI in Grounding Circuits of Critical Equipment: Preliminary Results 413
Talgat R. Gazizov, Van D. Nguyen, Adnan A. Hasan

Modeling of Electromagnetic Fields of Traction Networks Considering the Influence of Metal Supports of the Portal Type 418
Ekaterina V. Voronina, Andrey V. Kryukov, Aleksandr V. Cherepanov

Optimal Switching Order of a Reflection-Symmetric Flexible Printed Cable with Multiple Modal Reservation 424
Maria A. Samoylichenko

Optimization of a Double-Sided Flexible Printed Cable 429
Maria A. Samoylichenko

Multivariate Analysis of Multiconductor Transmission Line with Combinational Pulses in Time Response 435
Evgeniya B. Chernikova

Protecting Radial Electric Grid from Geoinduced Currents 441
Vera V. Vakhnina, Aleksey A. Kuvshinov, Aleksey N. Chernenko

Study of Aging and Determination of Optimum Hydrocarbon Composition of Transformer Oil 446
Ajgul R. Suleimanova, Rustem R. Vildanov

Developing Fuzzy Model Using the Key Gas Method to Determine the Defects Occurring in Oil Power Transformers 451
V. V. Vakhnina, E. V. Markov

Development of a Solar Power Plant for Heating an Oil Pipeline for High-Temperature Climatic Conditions 456
Regina Khazieva, Dilya Kurmieva

Solar Photovoltaic Power Plant Design 464
Regina Khazieva

Optimization of Mass and Dimensional Indicators of an Alternating Current Commutator Motor Using Experimental Design 472
Alexander V. Shestakov

Research of Transient Modes of a Servo Drive with a Second-Order Gradient Control Algorithm 478
Nikolay Malev, Azat Mukhametshin

Measurements of Insulation Parameter C3 on Installed, Faulted Line Bushings 485
Pavel Iskra, Violetta Zatsepina, Evgeny Zatsepin

Optimal Control of the Switched Reluctance Motor of High-Speed Rail Transport with an On-Board Energy Source 490
Alexandr D. Petrushin, Murot Tulyaganov

Alternative Current Sources in Electric Start Systems in Internal Combustion Engines 495
R. A. Maleev, M. A. Aleksuk, V. N. Kagdin

Two-Phase Power Converter for Electrodynamic Vibration System 501
Sergey Volskiy, Sergey German-Galkin, Aleksandr Kornev

Early Detection of Discrepancies in Multichannel Monitoring Systems 506
Andrey Makshanov, A. A. Musaev, D. A. Grigoriev

Traction Synchronous Machine with Rotor Field Winding and Controlled Magnetic Anisotropy 512
Vladimir Dmitrievskii, Vladimir Prakht, Vadim Kazakbaev

Electric Drive of a Single-Phase DC Electric Locomotive with Adaptive Excitation and Axial Traction Control 518
N. L. Mikhalchuk

Analysis of the Effectiveness of Using a Synchronous Generator with Integrated Torque Transformer 523
Elizaveta V. Koniushenko, Ilias Rahmanov, Oleg N. Molokanov

Switched Reluctance Electrical Machine Design with Elements of Parametric Optimization 528
Oxana Yushkova, Ildus Sayakhov, Iskander Garipov

Research of Operating Modes of a Variable Frequency Electric Drive to Improve Energy Efficiency 533
Elza R. Enikeeva, Elza A. Gilyazieva

Design, Calculation and Selection of Materials for Electrical Machines with Permanent Magnets 539
Ildus Sayakhov, Iskander Garipov, Oxana Yushkova

Operating Modes Analysis of an Asynchronous Motor in the Pumping Unit Drive Under Increased Load Conditions 547
A. V. Isaev, A. I. Nefed'Ev, I. A. Isaev

Working with Dvt Customer Software When Interacting with a Training Stand Simulating the Operation of an Electric Vehicle 552
Timur Petrov, Yulian Kadyrmyatov, Leonid Dolomanyuk

Features of the Work of the Training Stand “Electric Vehicle Motor” When Determining the Operating Characteristics of Electric Vehicles 557
Vasiliy Basenko, Sergey Kuzmin, Zumeira Shakurova

Using an Energy Storage System Based on Supercapacitors for Smoothing the Peak Loads in a Variable-Frequency Tram Electric Drive 562
Iurii Plotnikov, Vladimir Polyakov, Alena Savosina

Electronic Speed Controller of Collectorless Dc Motors of Unmanned Aerial Vehicles 570
Vyacheslav E. Vavilov, Rafael A. Kilmetov, Artur R. Khakimyanov

Laboratory Testing of Collector Characteristics 575
Olga A. Filina, Khalil F. Vakhitov, Olga V. Salnikova

Study of Brushless Generator with Multi-Pole Rotor for Direct-Drive Wind Turbines 582
Evgenij Koptjaev, Antonio J. Marques Cardoso

The Study of Using Various Types of Twelfth-Pulse Rectifier for DC Link of Power Converter 590
Dmitriy Sorokin, Sergey Volskiy, Yury Skorokhod

The Effects of Permanent Magnet Rounding on the Performance Characteristics of Synchronous Motor with Permanent Magnets 595
Arseniy V. Kuterman, Oleg A. Morozov

Research on the Applicability of Cable Sectional Windings as an Alternative to Windings Made of Winding Wire for High-Speed Servo Motors Has Been Conducted 600
Ilias Rahmanov, Elizaveta V. Koniushenko, Alexei S. Kulakov

A Single-Phase Monopolar Generator 605
Evgenij Koptjaev, Antonio J. Marques Cardoso

Heating Device for Thermal Migration of Local Zones Through Silicon Plates with a Diameter of Up to 100 mm 611
I. V. Gavrus, A. A. Yakovenko, A. N. Yatsenko

Sinusoidal Vs. Unipolar Current Supply of Rolling Rotor Electrical Machine 617
Oleg Molokanov

Calculation of Magnetoelectric Brushless DC Electric Motor in Polar Coordinates 623
Alexsandr A. Afanasyev, Valery S. Genin, Lidia N. Vasileva, Nadezhda N. Ivanova

Development of a Numerical Model of a Turbogenerator to Create a Database for Monitoring 629
Aleksandr Kostenko, Ekaterina Kurbatova, Yurii Kulayev

Development of Active Rectifier's Improved Control System with Stabilizing Effect for Voltage Sags Compensation 634
A. A. Nikolaev, I. G. Gilemov, A. C. Denisevich, P. G. Tulupov

Development of Improved Methodology for Setting Up Electro-Technological Modes of Electric Arc Steel-Making Furnaces of Modular Type 640
A. A. Nikolaev, P. G. Tulupov, S. S. Ryzhevol, P. I. Svyatkin

Nonparametric Soft Sensor Development for Distillation-In-Series Unit 647
Igor Mozharovskii, Svetlana Shevlyagina

Simulation Complex of Adaptive-Robust Control Systems for Multi-Mode Plants with Delay 652
E. A. Shelenok, S. A. Smirnova

Some Issues in Using the Model of Determining the User Stories Quality to Reduce Software Development Risks 658
Elena Jharko

Automated Monitoring of Energy Pulses and Interelectrode Gap in Electrical Discharge Machining 664
Sergey N. Grigoriev, Marina A. Volosova, Anna A. Okunkova

System Structure for Railway Switch Points and Signals Electrical Interlocking Powered by Renewable Energy Sources and Emergency Cable Network 670
Dmitrii V. Efanov, Davron Kh. Ruziev, Valerii V. Khóroshev

L-Dissipativity of Hyperstable Repetitive Control Systems..... 676
E. A. Shelenok

Optimization of Smart-Mini-Grids Operation Modes Based on Modified Particle Swarm Optimization Method..... 682
A. V. Bondarev, V. N. Efanov, A. A. Kuchkarova

Study of the Effectiveness of Implementing Monitoring Systems in Municipal Energy Infrastructure Using the Example of Individual Heating Points..... 688
Ekaterina Boyko, Alexander Dvortsevoy, Lyudmila Myshkina

Intellectualized Operator Information Support System for NPP: Expert Systems and Dynamic Models..... 694
Elena Jharko, Kirill Chernyshov, Ekaterina Abdulova

Research and Development of Algorithms for Dispatching Tasks in Distributed Computing Systems 700
Si Thu Thant Sin, E. M. Portnov, A. M. Bain

Computer Vision and Deep Learning Enabled Real-Time Liquid Level Detection and Measurement in Transparent Containers.....711
J. A. Syed, A. A. Takriti, R. R. Damindarov

On Application of the Method of Early Slag Recognition During Steel Casting 717
D. A. Poleshchenko, A. V. Korenev, Y. A. Kovrizhnykh

Towards Some Aspects of Forecasting the Risk Potential of NPP Processes: Model Selection (Using the Example of Cooling Water Heating Forecast) 722
Ekaterina Abdulova

Situational Forecasting and Control in Multi-Agent Systems 729
Sergei A. Dubovik, Aleksey A. Kabanov

Mathematical Model of Virtual Quality Analyzer for Selective Petroleum Oil Refining..... 734
Eduard D. Shakiryanov, Andrey N. Krasnov

Research on Ship Weather Routing Method Based on Dijkstra Algorithm and Neural Network..... 739
Khanh Doan Huu

Methods of Frequency Estimation Applied in Internet of Things Technologies 745
Zoya A. Kolosova, Vildan V. Abdullin, Dmitry A. Shnayder

Information Security System Models in Smart Campuses 750
Alexander Sobol, Victor Kochyn, Anna Huk

Development of an Unmanned Aerial Vehicle Control System Capable of Adapting to Changing Weather Conditions and Obstacles 755
Ignat Epifantsev, Kristina Epifantseva

Technical Vision for Object Recognition..... 760
Yurii Schetchikov, Sofia Sokolova

Acceleration of Calculations in Mechanical System Motion Simulation 766
Ivan M. Portnov, Angelina A. Medvedeva

Interaction Between Area Boundary and Formation of Agents Interacting by the Thermal Motion Equivalent Method 771
Eduard Heiss, Andrey Kozyr, Oleg Morozov

The Use of Cyber-Physical Systems in Metallurgical Production Management 778
Veronica Beliakova, Nikita Topolsky, Tatiana Patrakhina

Smart Cloud Equipment Tracking and Control System..... 783
V. V. Krutskikh, A. N. Ushkov, D. S. Chukashov, A. Yu. Trofimov

Development of Algorithm for Forming Optimal Mode of Heating Billets in Through-Type Furnace 789
S. M. Andreev, D. V. Nuzhin

Using the Gramian Method to Synthesize Robust Control Systems for Conveying Long Materials 795
A. M. Abbyasov, S. V. Tararykin

Particularities of Identification and Tuning of Linear Systems with State Controllers Using Artificial Neural Networks 800
Anatolv A. Anisimov, Mark E. Sorokovnin, Vladimir V. Tyutikov

Specifics of Controlling Mechatronic Systems with Non-Linear Kinematics in Variable Long-Term Tracking Modes..... 806
S. V. Tararykin, V. V. Apolonskiy

A Set of Technological Equipment for a Robotic 3D Printing System Using DED Technology..... 812
Sergei Sukhorukov, Anton Ovsyannikov, Svetlana Lepekhina

Robotic Device for Active-Passive Mechanotherapy of the Ankle Joint..... 818
Jamil Safarov, Egor Tistsov, Sergey Jatsun

Software and Hardware Platform Development for the Synthesis of Adaptive Algorithms and Methods for Controlling the Behavior of Collaborative Robotic System..... 824
D. M. Grabar, M. A. Gorkavyy, Y. S. Ivanov

Self-Timed Counter Synthesis..... 837
Yuri Diachenko, Yuri Stepchenkov, Dmitri Khilko

Mathematical Models for Tilt Measurement with a Triaxial Accelerometer 843
Dmitry Milovzorov, Vasikh Yasoveyev, Aidar Mukhamadiev

Algorithmic Conflict Detection in Process-Oriented Programs 848
Dmitry A. Permiashkin, Vladimir E. Zyubin

Industrial Internet of Things Algorithms for Fire Safety System Control 853
V. V. Krutskikh, A. N. Ushkov, A. Yu. Trofimov, D. S. Chukashov

The Computer Vision System for a Crewless Boat 859
Vadim A. Kramar, Oleg A. Kramar, Vasiliy V. Alchakov

Development of a Detector for Stamps on Images..... 865
Kseniia Prokudina, Mikhail Skriplyonok, Alexander Vostrikov

Determining the Carbon Pollution in a City by Monitoring Traffic Flows Using Machine Vision 870
Evgeniy Kozin, Dmitry Vohmin

Improving the Quality of the Disparity Map 875
D. S. Antipin, G. N. Ryavkin, E. V. Solomin

Application of YOLO Algorithm for Segmentation and Classification of Minerals in CT Slices Obtained by Dual- And Multi-Energy CT 880
Alexander A. Komarskiy, Andrey V. Ponomarev, Vladislav. V. Krinitzin

Experimental Studies of a Shadow Optical Sensor of Linear Dimensions and Displacements Based on a Charge-Coupled Device Photodetector 886
K. A. Palaguta, V. A. Shiryaev, N. V. Grunenkov

The Model of Wireless Sensor Network with Dynamic Packet Routing 892
Alexander Nomerchuk, Viktor Soloviev, Yulia Privalova

Analysis of Power Transformers Monitoring Systems 899
A. Y. Kubarev, A. E. Usachov, M. A. Paramonov

Detection Methods of Faults in Passive Optical Networks 904
Igor Bogachkov, Nikolay Gorlov, Oksana Bogatyreva

Unsupervised 3D Scene Reconstruction by Stereo Pair Images 915
Anton A. Zhilenkov, Oleg S. Krupinin

Device-Free Indoor Localization of a Person Based on Channel State Information 922
Alexandr Astafiev, Alexey Erofeev, Lyubov Karpycheva

Development of UAV Architecture with Integration of Android Smartphones for Expanding the Capabilities of the Technical Vision System and Onboard Computing 927
Maxim Kolpakov, Ksenia Prokudina, Vladimir Gorovoy

Incremental Training of Convolutional Neural Networks for Recognition of Marking Symbols 934
Andrey Mareev, Alexey Orlov

Method for Dynamic Measurements of Autonomous Underwater Probe Immersion Depth 939
Iurii E. Shishkin, Leonid A. Krasnodubets

Investigation of Transients in Induction Current Sensors Based on the Rogovsky Coil 944
V. V. Mikhaylov, O. Y. Kaun

Skin Dynamic Resistance Assessment by Means a Digital Generator with a Specified Exposure Mode 950
N. I. Yumagulov, A. L. Galiev, D. V. Topolsky

The Thermoelectric Generators as a Autonomous Power Supply Source of Geothermal Water Reagent-Free Treatment System 956
Alexey Korzhakov, Svetlana Korzhakova, Daniil Korzhakov

Assessment of Metrological Reliability of Measuring Channels in Commercial Oil Metering Systems 962
Marina Yu. Prakhova, Gennadiy Yu. Kolovertnov

Controlling the Reliability of Measuring Channels in Automated Monitoring Systems 967
Andrey N. Krasnov, Gennady Yu. Kolovertnov, Marina Yu. Prakhova

Dynamic Encryption Based on Deterministic Chaos 972
Tatiana Kainova

Application of GERG and AGA8 Methods for Calculation the Compression Factor of Natural Gas at Low Temperatures 978
Denis Kutovoy, Marina Shustrova, Victor Fafurin

Dynamic Analysis of the Reaction of a Scraper Conveyor When a Chain is Jammed 983
D. M. Shprekher, D. S. Ovsyannikov, A. V. Zelenkov

The Fusion-ICP Data Registration Algorithm Using Ortogonal Transformations for 3D Reconstructing of an Archaeological Sites' Models 990
A. Vokhmintcev, A. Mityanina, M. Romanov

Parallel Calculation of π in NoCs Using a Remote Testbed 996
M. Y. Romashikhin, I. I. Romanova

Ensemble Neural Network 3D-CNN and LSTM in the Problem of Assessing the State of a Technological System for Processing Ore Waste 1001
Andrey Puchkov, Maxim Dli, Vladimir Bobkov

Modeling of Mechanical Structures in CAAP-Systems 1007
Arkady Bozhko

Development of a Machine Learning Model for Production Facility Predictive Diagnostics 1012
Daniil Vorsin, Nikolay Toichkin

Methods of Analyzing Random Point Structures in Solving Some Applied Engineering Problems 1018
Alexander Reznik, Alexander Soloviev

Digital Twins and BIM Technologies for Industrial Systems Management 1023
Maxim M. Mashtakov, Irirna A. Brusakova

Approach to Pre-Processing of Diagnostic Data Using Fuzzy Logic 1028
Anna Kolodenkova, Svetlana Vereshchagina

Development of a Methodology for Studying Digital Instrument Transformers with the Digital Ground Faults Relay Protection Devices 1033
Galina Filatova, Dmitry Piskunov, Egor Isakov

Hybrid Algorithm for Real-Time Data Forecasting with Density-Based Clustering and Penalty Splines 1039
Elena Kochegurova, Vladislav Denisov, Maria Galkina

Solving the Inverse Heat Conduction Problem for Accurate Simulation of High-Temperature Processes 1045
Igor N. Ogorodnikov, Victoria V. Petukhova

Exploring Sequential Algorithms for Anomaly Detection in Multivariate Time Series 1050
A. Musayev, D. Grigoriev, A. Makshanov

Development of a Software and Hardware Complex for Prototyping an Unregulated Asynchronous Electric Drive 1056
Grigory P. Okhotkin, Mikhail S. Portnov, Lidia N. Vasileva

3D Modeling of Traction Electric Motors for Public Works Vehicles in SolidWorks Using Macros 1061
Dmitriy V. Rogov, Pavel O. Shaburov, Ramil A. Zakirov

Analyzing Simulink Modeling Capabilities of Real Technological Disruption in Power System Section 1067
Pavel Sorochenko, Violetta Zatsepina, Yevgeny Zatsenin

Automation of the Heat Protection Process for Acoustic-Magnetic Devices Installed in the Heat Supply System on Geothermal Water 1072
Alexey V. Korzhakov, Sergey V. Oskin, Victor A. Didych

Estimation of Influence of Technological Factors on Technological Variation of Assignment Indicators of Frequency Mixers with Resonant-Tunnel Diodes as Nonlinear Elements 1077
Kirill V. Cherkasov, Sergey A. Meshkov, Mstislav O. Makeev

Application of Petri Nets for Modeling Ore Flows to Create Dynamic Management and Quality Control System in Mineral Resource Complexes 1089
Pavel Larichev, Vadim Tynchenko, Ivan Nekrasov

Computer Vision Method for Detecting Safety Violations Using the YOLOv8 Model 1095
Pavel Medvedev, Vladimir Mokshin

Contemporary Issues in the Design and Creation of Computer-Based Helicopter Simulator Training Systems 1107
Mikhail Serebryakov

Method for Finding the Maximum Dynamic Flow in Periodic Fuzzy Graphs 1113
Alexander Bozhenyuk, Evgeniya Gerasimenko, Polina Nikashina

Application of Linear Regression and Artificial Neural Networks for Load Forecasting the Consumption of Fuel and Energy Resources Train Traction 1118
Aleksandr Komyakov, Aleksey Davydov, Victoria Vitovskaya

The Development of Approaches to Optimize Wireless Access Networks 1124
Tatyana Avetisyan, Andrey Preobrazhenskiy, Yuriy Preobrazhenskiy

Ways to Improve Efficiency of Heat Exchange and Optimize Heat Removal in Radio-Electronic Equipment 1129
Ilya M. Rybakov, Vladimir R. Roganov, Egor A. Vershinin

Countering Adversarial Zeroth Order Optimization Attacks Based on Neural-Cleanse, Gaussian and Poisson Noise Adding 1135
Igor Kotenko, Igor Saenko, Vladimir Sadovnikov

Methodology for Analyzing the Performance of 5G-NR Networks During Initial Planning Without Deployment Using the NS-3 Network Simulator 1141
A. Y. Larionov, E. E. Karanova

Development of a Digital Twin of a Collaborative Robot-Manipulator 1146
Kristina Epifantseva, Ignat Epifantsev

Comparative Analysis of Physical Correctness of Models Using Classical and Variational Integrators 1151
Ilya Moiseev

Improved Real Time Simulation of Fluid-Solid Interactions for Virtual Maritime Test Sites 1159
Maksim S. Minin

Modelling Algorithms and Protocols for Congestion Control in TCP/IP Networks 1164
A. I. Martyshkin

Simulation Tool Requirements for Modeling the Execution of Technological Process Operations by Collaborative Robotic System Participants 1169
Mark V. Mamchenko, Saniya B. Galina

Time Series Clustering in High-Noise Conditions in the Data 1185
Timur Murtazin, Timur Ismagilov

Methods for Converting and Dividing a 3D Model into Layers for Additive Manufacturing 1190
M. A. Volokhov, A. V. Drobotov, A. M. Makarov

Modelling and Analysis of Data Flows in IoT Networks 1195
A. I. Martyshkin

A Model for Calculating the Power of a Source of Nitrogen Oxide Emission from the Mouth of an Industrial Pipe 1200
Olga Ivanova, Boris Markov, Irina Gainova

Subsurface Exploration Systems for Shallow Geophysics 1205
Ivan V. Bryakin, Igor V. Bochkarev, Vadim R. Khramshin

Transient Processes Analysis in Electromagnetic Machines with Electric Impulse Control 1211
Igor V. Bochkarev, Rifkhat R. Khramshin, Zhalalidin T. Galbaev, Aida R. Sandybaeva

Development of an Improved System for Controlling Electrical Modes of Ladle-Furnace by Using a Digital Twin 1216
A. A. Nikolaev, P. G. Tulupov, S. S. Ryzhevol, V. S. Ivekeev

Furnace Transformer Protection Device Mitigating Open-Phase Mode During Switching of Vacuum Circuit Breaker 1221
Andrey A. Radionov, Ivan V. Lyubimov, Rifkhat R. Khramshin

Online Monitoring System for OLTC of Furnace Transformer 1226
Stanislav S. Voronin, Alexander S. Karandaev, Vadim R. Khramshin

Digital Temperature Observer for Rolling Mill Motors 1232
Andrey A. Radionov, Boris M. Loginov, Andrey B. Loginov

Author Index