

2024 Intelligent Technologies and Electronic Devices in Vehicle and Road Transport Complex (TIRVED 2024)

**Moscow, Russia
13-15 November 2024**



**IEEE Catalog Number: CFP24AU8-POD
ISBN: 979-8-3315-1871-4**

**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:	CFP24AU8-POD
ISBN (Print-On-Demand):	979-8-3315-1871-4
ISBN (Online):	979-8-3315-1870-7

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

CURRAN ASSOCIATES INC.
proceedings
.com

TABLE OF CONTENTS

Dataset Annotation Converter for Training Neural Networks to Detect Defects on Various Surfaces	1
<i>Levon V. Agamirov, Vladimir L. Agamirov, Vadim S. Los, Maxim Nosikov, Nataliya V. Toutova</i>	
Uniqueness in Linear Inverse Problems for an Abstract Differential Equation of the Second Order	5
<i>Muataz Almohamed</i>	
Improving the Accuracy of Acoustic Emission Sources Linear Location Based on Constructing the Acoustic Signal Envelope Via the Hilbert Transform.....	10
<i>T. D. Balandin, D. V. Chernov</i>	
Development of a Method for Robotic Sorting of Metal Objects.....	14
<i>Nikita V. Belov, Liliya I. Voronova, Mariya V. Khokhlova</i>	
Peculiarities of Propagation of Annular and Laguerre-Gaussian Beams in the Atmosphere	20
<i>V. N. Belyi, N. S. Khilo, P. K. Petrov</i>	
Spectral Selection System of Narrow Band Radiation of the Excimer KrF Laser	24
<i>S. M. Bobrovnikov, E. V. Gorlov, V. I. Zharkov</i>	
Optimizing Traffic Flow Using Quantum Annealing	28
<i>V. A. Bogatyrev, V. S. Moskvina</i>	
Multi-Criteria Analysis of Genetic Algorithm Applications in Transportation Logistics	33
<i>A. M. Borzenkov, A. V. Ostroukh, C. B. Pronin, A. A. Podberzkin, N. G. Kuftinova</i>	
Determining the Time and Volume of Supply of Materials for the Production of Asphalt Concrete Mixtures	37
<i>Maria A. Brezhneva, Yuri E. Vasiliev, Igor E. Sahakyan, Maxim M. Nikitaev, Georgy Sh. Malazonia</i>	
Assessment of the Impact of Materials and Production Technology on the Durability of Asphalt Concrete Structural Layers of Road Clothing	42
<i>Alexander A. Butrinov, Sergey V. Varshavskiy, Yuri E. Vasiliev, Maria A. Brezhneva, Peter I. Lykashchuk</i>	
Spectral Thermography Techniques for Melt Pool Thermal Imaging in Electron Beam Additive Manufacturing	49
<i>Alexey Bykov, Demid Khokhlov, Mikhail Polyakov</i>	
Features of Spectral Analysis Using Complex Discrete Cosine Transform.....	53
<i>T. V. Chernysheva, O. B. Popov, V. A. Abramov, P. S. Sapronov</i>	
Investigation of Thermopower of Pure Metals and Structural Materials at High Temperatures Aimed to Simulate Electron Beam Welding of Dissimilar Materials	60
<i>I. S. Chulkov, A. L. Goncharov, Kh. M. Kozyrev, V. S. Fadeev</i>	
Restoration of the Impulse Profile in the Remote Monitoring System of Technical Facilities.....	65
<i>Dmitry V. Churikov, Maksim V. Grachev, Igor A. Stupin</i>	
Development of a Chemosensor for Measuring Ammonia Concentration Dissolved in Water	70
<i>Oleg D. Demekhin, Pavel S. Plyaka</i>	

Measurement of Optical Quality Parameters of Crystalline Lithium-Sodium Molybdate	74
<i>D. A. Denisov, D. Yu. Demushkin</i>	
On One Algorithm in the Generalized Artin Tree Group.....	78
<i>Irina Dobrynina</i>	
Practical Aspects of Electrical Vehicle Usage on Current Condition	82
<i>Ph. K. Dyakov, A. N. Andreev, M. A. Toporkov, M. I. Alexeenkov, E. P. Dyakov</i>	
Scientometric Analysis of the TIRVED-2024 Conference Papers Reviewing Results.....	86
<i>Svetlana S. Dymkova, Irina S. Kretova, Oleg V. Varlamov</i>	
Development of a System for Prevention of Collisions of Microtransports with Pedestrians.....	91
<i>Vitalij V. Gaevskij, Andrey M. Ivanov, Irina V. Odinokova</i>	
The Use of Convolutional Neural Networks to Classify the States of the Maxillary Sinuses in Digital Diaphanoscopy	96
<i>D. V. Gerasin, E. O. Bryanskaya, V. V. Dremin, A. V. Dunaev</i>	
Application of Machine Learning Methods to Solve the Problem of Classifying Materials Based on the Results of Measuring Their Thermoelectric Power	100
<i>A. L. Goncharov, I. S. Chulkov, Kh. M. Kozyrev, V. S. Fadeev</i>	
Methods and Algorithms for Visualizing the Volumetric Model of an Object Based on Its Visible Part	105
<i>Maksim Grachev, Dmitry Churikov</i>	
Rapid Determination of Temperature Distribution in Diamond Anvil Cells from Multispectral Camera Images by Fully Connected Neural Network	109
<i>P. A. Grishaev, K. M. Bulatov, P. V. Zinin</i>	
Virtual Radiophysics Laboratory.....	113
<i>Dmitry S. Gubsky, Sergey V. Krutiev, Irina N. Ivanova, Svetlana A. Vyatkina</i>	
Evaluating the Operational Safety of a Passenger Car Automatic Emergency Braking System	117
<i>Andrey M. Ivanov, Daria A. Makarova, Sergey S. Shadrin</i>	
Comparative Analysis of the Efficiency of Using a Diesel and Electric Loader Taking into Account the Resource Limitations of the Battery	122
<i>Maria. Yu. Karelina, Boris S. Subbotin, Petr I. Smirnov, Ekaterina A. Karelina</i>	
Optimization of Compressive Ghost Imaging in the Terahertz Range Using Correlation-Based Ranking in Optical System Transmission.....	127
<i>Ildus Sh. Khasanov, Tatyana V. Blagova</i>	
Data Acquisition System for Multichannel Fourier Spectrometer.....	132
<i>Aleksandr I. Khorokhorin, Vasilij A. Vagin</i>	
Features of Methods for Modifying Cantilevers for Atomic Force Microscopy	136
<i>Sergey Krasnoborodko, Yury Vysokikh, Pavel Zinin, Alexey Bykov, Dmitry Churikov</i>	
Concept of Passive and Post-Accident Part Assessment for Non-Commercial Vehicles Integrated Safety Design	140
<i>S. R. Kristalnyi</i>	
Application of Students' Scientific Potential to Modernization of Laboratory Work Complex	146
<i>A. Y. Kudryashova, N. E. Poborchaya, I. S. Kretova</i>	

Efficient Machine Learning Methods for Real-Time Transport System Optimization and Predictive Maintenance	150
<i>N. G. Kuftinova, A. V. Ostroukh, O. I. Maksimych, C. B. Pronin, I. A. Ostroukh</i>	
Acousto-Optical Spectroanalyzer on Azimuthally Inhomogeneous Bessel Light Beams	156
<i>G. V. Kulak, V. I. Kazakov, O. V. Shakin</i>	
Attenuated Total Reflection Fiber Probes for Real-Time Measurements in the Mid-Infrared Range	160
<i>D. Yu. Kuznetsova, V. A. Vagin</i>	
The Causes and Sources of the Evolution of Engineering Education Competencies in the Field of Electronics and Communications	164
<i>T. A. Kuzovkova, O. I. Sharavova, M. M. Sharavova</i>	
Research of Neural Networks ChatGPT Used to Generate Code in Python Programming Language	169
<i>Yuri Leokhin, Timur Fatkhulin, Mikhail Kozhanov</i>	
Practical Application Possibility of Holographic Antennas for Adaptive Signal Processing.....	175
<i>Oleg S. Litvinov, Aleksandr N. Zabelin, Klavdia M. Koroleva, Vsevolod V. Sivakov</i>	
Development of Methods for Monitoring and Predicting the Safety of Automated Vehicles in Operation.....	181
<i>Daria A. Makarova, Sergey S. Shadrin, Yury M. Furletov, Andrey M. Ivanov</i>	
Automation of Ultrasonic Testing Technology for Soldered Joints of Heat Exchanger Elements	190
<i>Valeriy V. Malyy, Igor Y. Kinzhagulov, Vladimir E. Prokhorovich</i>	
Control System for Operating Modes of Fiber Lead Bending Formers	196
<i>Elnur Mansurov, Irina Yablochnikova, Maya Kerimova, Tofig Mansurov, Sergey Yablochnikov</i>	
Method of Online Control of Detonation Properties of Hydrocarbon Fuels	201
<i>Tofig Mansurov, Sakina Abbasova, Maya Kerimova, Sergey Yablochnikov, Irina Yablochnikova</i>	
Study of the Influence of Substrate Material and Thickness of Indium Tin Oxide Coatings on Their Optoelectronic Characteristics.....	206
<i>P. A. Mikhalev, B. A. Parshin, S. Y. Hydyrova, K. M. Moiseev, A. S. Voronin</i>	
Quantum Blockchain Architecture for Transportation Services	210
<i>V. S. Moskvina</i>	
Calculation of Natural Vibration Frequencies of a Box Structure with Thermal Protection	216
<i>Ramil A. Nezhmetdinov, Damir T. Bautdinov, Alexey D. Chudnovsky, Dilshod D. Yusupov, Vladimir V. Bogdanov</i>	
Forced Transverse Vibrations of a Box Structure from the Action of a Plane Shock Wave, Based on a Flexible Plate Model.....	220
<i>Dmitry V. Nikitin, Ramil A. Nezhmetdinov, Vladimir V. Bogdanov, Damir T. Bautdinov, Andrey A. Aleshkin</i>	
On the Elasto-Optic Constants of Linear Isotropic Dielectrics	224
<i>Pavel A. Nikitin, Vitold E. Pozhar</i>	
Research on Using Deep Learning for Transport Demand Prediction.....	228
<i>A. V. Ostroukh, N. G. Kuftinova, A. M. Borzenkov, A. A. Podberezkin, I. A. Ostroukh</i>	

Structural and Morphological Analysis of Diamond-Like Carbon Coatings Deposited Using Different Methods	233
<i>B. A. Parshin, M. O. Makeev, P. A. Mikhalev</i>	
Identification of Blood Serum Compound by Decomposition of Raman Spectra by Multivariate Curve Resolution Method.....	237
<i>I. A. Pimenova, I. A. Matveeva</i>	
Determination of Traffic Flow Parameters Using High-Precision Positioning System to Improve Traffic Efficiency and Safety.....	241
<i>Maxim G. Pletnev, Pavel I. Pospelov, Alexey A. Akulov, Dmitry S. Taldykin, Alexey G. Zaitsev</i>	
Evaluating the Performance of Using Mobile Roadside Units for Task Offloading in V2X Systems.....	249
<i>Pavel V. Plotnikov, Gleb I. Tambovtsev, Andrey G. Vladyko</i>	
Experimental Determination of the Effectiveness of the Lane Support System.....	253
<i>N. V. Popov, V. V. Gaevskiy, A. N. Andreev, Ph. K. Dyakov, I. F. Endrukhin</i>	
Reduction of the Transmission Rate of Sound Broadcasting Signals Based on Their Modulation Representation	257
<i>Oleg B. Popov, Kirill A. Korostelev, Tatiana V. Chernysheva, Kirill V. Orlov</i>	
Service Model of Megalopolis Traffic Flow Management.....	263
<i>Pavel I. Pospelov, Maxim G. Pletnev, Artem V. Podgorny, Alexey A. Akulov, Alexey G. Zaitsev</i>	
Optical Polyspectral Imaging Systems. Classification	269
<i>Vitold Pozhar</i>	
Evaluation of Electromagnetic Wave Propagation Characteristics in Wireless Communication Systems.....	273
<i>Andrey Preobrazhenskiy, Yuriy Preobrazhenskiy, Tatyana Avetisyan, Nikita Marenkov</i>	
Evaluating Consistency of Image Generation Models with Vector Similarity	277
<i>C. B. Pronin, A. A. Podberezkin, A. M. Borzenkov</i>	
Educational and Methodological Complex in Higher Mathematics for Students of Technical Specialties.....	281
<i>A. M. Raitsin, A. R. Lakernik</i>	
The Role of Artificial Intelligence in Improving the Effectiveness of Professional Training of Students of Electrical Engineering and Electronic Engineering.....	286
<i>Tatyana Y. Salutina, Galina P. Platunina, Irina A. Frank</i>	
Software-Defined Radio Wireless Communication Technology Design. MIMO 4×4 Mode Configuration.....	291
<i>Nikita Sheremet, Grigory Fokin</i>	
Intelligent Road Surface Repair Planning	295
<i>Kirill E. Shugaev, Peter I. Lykashchuk, Alexei A. Tsesar, Maxim M. Nikitaev, G. Malazoni</i>	
Management Principles in Intelligent Passenger Transportation System	301
<i>Alena Shviatsova, Haiwei Wang, Vasily Shuts, Yajing Zheng, Chengtao Cao</i>	
Estimation of Energy Consumption on Urban Access Roads Using the Two-Fluid Model	307
<i>Petr I. Smirnov, Boris S. Subbotin, Ekaterina A. Karelina, Roman O. Sudorgin, Vera V. Silakova</i>	

Method for Regularized Estimation of the Optical Flow Velocity Field in Computer Vision Systems	311
<i>S. V. Sokolov, D. V. Marshakov, I. V. Reshetnikova, E. G. Chub</i>	
Non-Destructive Testing of Resistive Components Using Low-Frequency Noise Measurement	316
<i>Vyacheslav A. Sokurenko, Yuri V. Sakharov</i>	
Using Specialized Corpora in Teaching English for Specific Purposes to Students of Postgraduate Engineering Program	320
<i>Nataliya Solovyeva</i>	
Methodology for Detecting Anomalous Traffic Flows in the Network Based on the Hurst Parameter	324
<i>Boris S. Subbotin, Roman O. Sudorgin, Ekaterina A. Karelina, Petr I. Smirnov</i>	
Application of Multivariate Curve Resolution Analysis and Multilayer Perceptron for Classification of Raman Spectra of the Skin	330
<i>Ksenia Tomnikova, Irina Matveeva</i>	
Forecasting the Traffic Situation as a Possible Way to Improve the Effectiveness of ADAS in Urban Environment	335
<i>M. A. Toporkov, Ph. K. Dyakov, A. N. Andreev, M. I. Alexeenkov</i>	
Blockchain in Education: A New Approach to Storing and Verification of Academic Works	339
<i>Natalia V. Toutova, Alexandra P. Gaeva, Vladimir L. Agamirov, Levon V. Agamirov, Iliya A. Andreev</i>	
Software for Visualization of Cellular Automata Models in Traffic Flow Analysis	343
<i>Marina A. Trapeznikova, Marina V. Yashina, Alla G. Garibyan</i>	
Methodology for Training a Neural Network for Recognizing Road Pavement Defects	347
<i>Alexei A. Tsesar, Sergey V. Varshavskiy, Kirill E. Shugaev, Maxim M. Nikitaev, Kirill A. Barinov</i>	
Spectral Data Filtering to Increase Its Discriminative Power	352
<i>Vasiliy A. Vagin, Stepan A. Krasnikov, Andrey E. Krasnov</i>	
System for Measuring the Transverse Flatness of the Roadway	356
<i>Sergey V. Varshavskiy, Alexei A. Tsesar, Yuri E. Vasiliev, Gennady G. Yagudaev, Maria A. Brezhneva</i>	
Development of a Pedestrian Target for Testing Driver Assistance Systems	361
<i>A. I. Vorobyev, L. O. Fedosova, A. V. Zolotov, D. A. Kashnikov, D. A. Shakin</i>	
Vehicle Tracking Algorithm of Speed Estimation Based on Traffic Video Analysis	365
<i>M. V. Yashina, Ya. A. Akilin, V. V. Osada, A. F. Smyk</i>	
Mesodynamic Model of Conflict in Traffic Flow	371
<i>S. V. Zhankaziev, V. V. Dronseiko, A. M. Merkovich, Yu. A. Korotkova, A. V. Zamytskih</i>	

Author Index