2023 Intelligent Technologies and Electronic Devices in Vehicle and Road Transport Complex (TIRVED 2023)

Moscow, Russia
15 – 17 November 2023

IEEE Catalog Number: CFP23AU8-POD
ISBN: 979-8-3503-1763-3

Copyright © 2023 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: CFP23AU8-POD
ISBN (Print-On-Demand): 979-8-3503-1763-3
ISBN (Online): 979-8-3503-1762-6

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

A.S. Adzhemov, A.Y. Kudryashova, N.E. Poborchaya
APPLICATION OF A SMART SYSTEM FOR DEVELOPING INTERACTIVE TESTS IN TEACHING COMMUNICATION THEORY DISCIPLINES...1

Alexey A. Akulov, Vladimir S. Ershov, Boris B. Sidorov, Rustam R. Mirzaev, Dmitriy S. Taldykin
CALCULATION OF THE DESIGN OF THE AIRFIELD OF AERODROME EQUIPMENT USING ITS MODELING IN THE SOFTWARE PACKAGE...5

Mukhamed T. Aleroev, Marina V. Yashina
METHODS FOR OPTIMIZING THE DEFORMATION-STRENGTH CHARACTERISTICS OF POLYMER CONCRETE...11

Alexey N. Andreev, Maxim A. Toporkov, Yury M. Furletov, Maxim I. Alexeenkov
INTERACTION OF HIGHLY AUTOMATED VEHICLES WITH PERSONAL MOBILITY DEVICES IN THE URBAN ENVIRONMENT...15

Andrey Yu. Andreev, Alexey V. Terentyev, Roman O. Sudorgin, Vladimir V. Filatov, Vladimir S. Ershov
DEVELOPMENT OF A HETEROGENEOUS DYNAMIC TRANSPORT SYSTEM BASED ON THE BELLMAN FUNCTION TO OPTIMIZE THE PROCESS OF PLANNING AUTOMOBILE ROUTES...19

M.V. Andreeva, M.Y. Zvezdochkin
APPLICATION OF MORPHOLOGICAL OPERATIONS AND HOUGH TRANSFORM FOR RECOGNIZING OBJECTS IN AN IMAGE WHEN HIGH INTENSITY GLARE OCCURS...24

Kristina A. Arzhanova, Sergey B. Benevolensky
METHODOLOGY FOR IMPLEMENTING NEURAL NETWORKS INTO THE MANAGEMENT OF MARKETING COMMUNICATIONS OF COMPANIES...28

Mikhail Bakulin, Taoufik Ben Rejeb, Vitaly Kreyndelin, Denis Pankratov, Aleksei Smirnov
PROBLEMS OF COMBINING NOMA WITH MIMO...33

Viktor Bogachev, Alexandra Kravets, Taras Bogachev, Tamara Alekseychik
INFORMATION TECHNOLOGIES IN LOGISTIC MODELING OF RAILWAY FREIGHT TRANSPORTATION IN PORT TRANSPORT AND TECHNOLOGICAL SYSTEMS...38

V.A. Bogatyrev, V.S. Moskvin
APPLICATION OF GROVER'S ALGORITHM IN ROUTE OPTIMIZATION...45

Maria A. Brezhneva, Kirill E. Shugaev, Yuri E. Vasiliev, Alexei A. Tsesar, Sergey V. Varshavskiy
MODELS FOR CALCULATING THE PAVEMENT CONDITION INDEX...50

Phillip K. Dyakov, Ivan N. Rovchanin, Maxim I. Alexeenkov, Alexey N. Andreev, Egor P. Dyakov
BLOCKING GRID USAGE FOR ADVANCE DRIVER ASSIST SYSTEM (ADAS) EVALUATIONS ON PROVING GROUND...55

Timur Fatkhulin, Yuri Leokhin, Maxim Mentus, Alena Kulikova, Rafif Alshawi
ANALYSIS OF THE BASIC IMAGE GENERATION METHODS BY NEURAL NETWORKS...61

Vladimir V. Filatov, Maria Yu. Karelina, Nikolay V. Solovyov, Igor Yu. Kashtanov, Sergey V. Sidorenko
EFFICIENCY IMPROVEMENT OF THE IMPLEMENTATION OF RESEARCH WORK ON THE BASIS OF HIGHER EDUCATIONAL INSTITUTIONS...68

Grigoriy Fokin, Dmitriy Volgushev, Vladimir Grigoriev, Konstantin Ryutin
SOFTWARE-DEFINED RADIO NETWORK POSITIONING TECHNOLOGY DESIGN. FIELD EXPERIMENT DEMONSTRATOR...72

Vitalij V. Gaevskij, Andrey M. Ivanov, Irina V. Odinokova
MAINTAINING SAFETY IN THE SYSTEM OF THE NEW URBAN MOBILITY...78

Alla G. Garibyan
DEVELOPMENT OF A NETWORK COMPUTER LABORATORY FOR TRAINING IN ROAD TRAFFIC SIMULATION AND MODEL VERIFICATION...83

M.V. Gavrilyuk, A.I. Vorobyev, T.V. Vorobyeva, D.Yu. Morozov, A.M. Merkovich
PRINCIPLES OF THE FORMATION OF PHYSICAL AND FUNCTIONAL ITS ARCHITECTURES...87

Dmitrii S. Gerasimov, Marina V. Yashina
ACCUMULATION OF INTERFERENCE OF MODULATION SCHEMES OF COMMUNICATIONS IN SATURATED TRAFFIC FLOWS...92

B.G. Ibrahimov, A.D. Tagiyev, M.Y. Orujova
RESEARCH MULTISERVICE ACCESS NETWORKS WHEN TRANSMITTING HETEROGENEOUS TRAFFIC...96

O.V. Ilina, M.V. Tereshonok
ADAPTIVE METHOD TO INCREASE VEHICLE DETECTION SYSTEM ROBUSTNESS ON BLURRED AND NOISY AERIAL IMAGES...102

Ekaterina A. Karelina, Alexey A. Stepanov, Petr I. Smirnov, Artem V. Podgornuy, Vitaly V. Guly
DETECTION OF ABNORMAL TRAFFIC FLOW WITH THE HURST PARAMETER FOR TRAFFIC MANAGEMENT...108

Maria Yu. Karelina, Alexey A. Akulov, Petr I. Smirnov, Natalia V. Atamanenko
A METHOD FOR CONSTRUCTING AN URBAN PUBLIC TRANSPORT NETWORK BASED ON THE ASSESSMENT OF TRAFFIC FLOWS BY ITS DETECTORS...113

Alexander A. Kiryanov, Vladimir Yu. Sirotkin, Sergey B. Benevolensky, Evgeniy V. Subachev
THE SOFTWARE OF CONTROL SYSTEM FOR COLLECTIVE WORK OF THE TECHNICAL DEVELOPMENTS...118

Vitaly Kreyndelin, Mikhail Bakulin, Taoufik Ben Rejeb, Denis Pankratov, Aleksei Smirnov
ANALYSIS OF QAM CONSTELLATIONS WITH BINARY SIGNAL REPRESENTATION...122

N.G. Kuftinova, A.V. Ostroukh, D.K. Izmailova, M.A. Pirozhkov
ENVIRONMENTAL, SOCIAL, AND GOVERNANCE FACTORS IN TRANSPORTATION PLANNING...129

Tatyana A. Kuzovkova, Alexander D. Kuzovkov, Olga I. Sharavova, Maria M. Sharavova
PROSPECTS FOR THE DEVELOPMENT OF UNMANNED TRANSPORT BASED ON 5G AND 6G MOBILE COMMUNICATION TECHNOLOGIES...135

Yuri Leokhin, Timur Fatkhulin, Alena Kulikova
RESEARCH OF THE INFLUENCE OF THE SEMANTICS AND SYNTAX OF A TEXT REQUEST ON THE IMAGE QUALITY GENERATED BY NEURAL NETWORK TECHNIQUES...142

S.Z. Lygdenov, I.Z. Lygdenova
DATA TRANSMISSION WITH PRIORITY SERVICE AND LIMITED CAPACITY STORAGE IN UNSTATIONARY FLOW AND HIGH LOAD...149

Daria A. Makarova, Sergey S. Shadrin, Yury M. Furletov, Andrey M. Ivanov
METHODOLOGY FOR ASSESSING THE AUTOMATED VEHICLES SAFETY BASED ON OPERATIONAL DATA...153

T.M. Mansurov, E.T. Mansurov, S.V. Zhdanovich, I.O. Yablochnikova, F.V. Dzodzikova
UNIVERSAL FIBER OPTIC COUPLER / SENSOR...159

N.V. Mokrova, S. L. Yablochnikov, L.E. Surkova, A.V. Safonova, A.M. Mokrov
IMPLEMENTATION OF CLASSIFICATION ALGORITHMS FOR DATA TRAFFIC ANALYSIS...164

V.S. Moskvin
QUANTUM NEURAL NETWORKS AND THEIR POTENTIAL IN TRAFFIC PREDICTION...169

A.F. Nadeev, T.F. Shcherbakova, A.A. Kobyzeva, S.S. Sedov
VEHICLE DRIVER CONDITION MONITORING SYSTEM BASED ON ELECTROCARDIOGRAPHIC SIGNAL ANALYSIS...174

Anton A. Noskov, Alexey V. Terentiev, Ekaterina A. Karelina, Vladimir V. Filatov, Roman O. Sudorgin
THEORETICAL FOUNDATIONS FOR DESIGNING AN INTELLIGENT SYSTEM FOR CONTAINER FREIGHT ROAD TRANSPORT...178

Irina V. Odinokova, Alexander V. Sukhodolya, Artem V. Podgorny, Dmitry A. Nikitin, Alexey E. Sorokin
DEVELOPMENT OF AN ELECTRONIC CONTROL SYSTEM A NEW GENERATION OF AIRFIELD IRRIGATION MACHINE EQUIPMENT...182

A.V. Ostroukh, N.G. Kuftinova, A.A. Podberezkin, B.S. Subbotin, A.V. Podgornyi
USE DIGITAL TWINS AND THE METAVERSE TO ANALYSIS DATA IN THE AGGLOMERATION TRANSPORT NETWORK...186

Galina P. Platunina, Tatyana Y. Salutina, Irina A. Frank
MEGATRENDS OF DIGITAL ENGINEERING TECHNOLOGIES: ANALYSIS OF THE MODEL OF INTEGRAL ASSESSMENT OF THE STATE AND POTENTIAL OF DIGITAL DEVELOPMENT IN THE CONDITIONS OF THE FOURTH INDUSTRIAL REVOLUTION...191

Pavel Plotnikov, Gleb Tambovtsev, Andrei Vladyko
PERFORMANCE EVALUATION OF V2X MODEL WITH A MOBILE ROAD SIDE UNITS...195

N.V. Popov, V.V. Gaevskiy, A.N. Andreev, Ph.K. Dyakov, I.V. Pivovar
CARRYING OUT FAULT TOLERANCE TESTS OF AUTOMATIC EMERGENCY BRAKING SYSTEMS TO PREVENT COLLISIONS WITH A BYCYCLIST...199

O.B. Popov, T.V. Chernysheva, V.A. Abramov, A.A. Borisov
RATIONAL USE OF DYNAMIC RANGE IN ANALOG-TO-DIGITAL CONVERSION...203

Timur D. Potapchenko, Mikhail G. Gorodnichev, Fedor D. Potapchenko, Lionella A. Fedotova
APPROACHES TO ACCOUNTING FOR GREENHOUSE GAS EMISSIONS FROM VEHICLES IN PERSONAL USE...208

Viatcheslav M. Prikhodko, Dmitry S. Simonov, Nikita N. Kalyagin, Andrei M. Butov, Andrey V. Vasiliev
MODERNIZATION OF BUCKET CUTTING EDGE USING SOFTWARE MODELING...212

C.B. Pronin, A.V. Ostroukh, D.K. Izmailova, M.A. Pirozhkov
ENVIRONMENTAL, SOCIAL, AND CORPORATE GOVERNANCE PERSPECTIVES IN DEVELOPMENT OF QUANTUM VECTOR DATABASES BASED ON GROVER'S ALGORITHM...216

Dmitriy V. Rybakov, Ekaterina A. Karelina, Vladimir V. Filatov, Zhibek N. Turdumatova, Nikolay V. Solovyov
APPROACHES TO THE CREATION, PILOT IMPLEMENTATION AND ORGANIZATION OF OPERATION AND USE OF UNMANNED SYSTEMS AND COMPLEXES...220

Tatyana Y. Salutina, Galina P. Platunina, Irina A. Frank
FEATURES OF RISK MANAGEMENT OF DIGITAL AND INFOCOMMUNICATION DEVELOPMENT TO ENSURE A UNIFIED INFORMATION SPACE OF COMPANIES IN MODERN CONDITIONS...225

Ekaterina F. Shamaeva, Elizaveta A. Alexandrova
THE MANAGEMENT OF ENGINEERING AND TECHNICAL DEVELOPMENTS IN A REGIONAL ENVIRONMENT BASED ON ECOLOGICAL-SOCIO-ECONOMIC INFORMATION...229

S.A. Sidnev, L.Y. Krasikova, G.S. Artemeva, L.I. Gushchina
NETWORK MULTICHANNEL COMMUNICATION DEVELOPMENT PLAN...235

Petr I. Smirnov, Alexey A. Akulov, Boris B. Sidorov, Boris S. Subbotin, Igor Yu. Kashtanov
ROAD INFRASTRUCTURE OPTIMIZATION TO IMPROVE THE ENERGY EFFICIENCY OF VEHICLES...239

Anatoliy A. Solovyev, Andrey M. Valuev
AUTOMATIC CONTROL METHODS AS THE BASIS FOR THE DEVELOPMENT OF INTELLIGENT URBAN TRAFFIC CONTROL SYSTEMS...244

Vasiliy S. Starostin, Dmitry V. Dolgopolov, Kristina A. Arzhanova
MANAGING THE ARTIFICIAL INTELLIGENCE TECHNOLOGIES FOR THE HIGHER EDUCATION SPHERE...249

Alexander Stempkovskiy, Roman Solovyev, Dmitry Telpukhov, Alexander Kustov
HARDWARE IMPLEMENTATION OF CONVOLUTIONAL NEURAL NETWORK BASED ON SYSTOLIC MATRIX MULTIPLIER...254

Alexey V. Terentiev, Maria Yu. Karelina, Vladimir S. Ershov, Yaroslav E. Pirogov, Roman O. Sudorgin
ANALYTICAL MODEL OF THE ORGANIZATION OF FREIGHT TRAFFIC IN THE INTELLIGENT TRANSPORT SYSTEM OF THE METROPOLIS...259

Andrew V. Toutov, Natalia V. Toutova, Georgy A. Bulanov, Elena A. Frolova, Iliya A. Andreev
RESOURCE ALLOCATION ALGORITHMS FOR SINGLE, CLUSTER AND TIRED VIRTUAL MACHINES...263

Yu.V. Trofimenko, A.N. Yakubovich, V.M. Lytov
DEVELOPMENT OF APPROACHES TO UPDATED DATABASE ON THE VEHICLE FLEET OF VARIOUS COUNTRIES FOR ASSESSING GROSS GREENHOUSE GAS EMISSIONS...267

Alexei A. Tsesar, Maxim M. Nikitaev, Kirill A. Barinov, Yuri E. Vasiliev, Kristina V. Mikolaichuk
METHODOLOGY FOR SELECTING NEURAL NETWORK ARCHITECTURE FOR RECOGNIZING PAVEMENT DEFECTS...272

Alexandr G. Tynyanyy, Sergey R. Kristalniy, Phillip K. Dyakov, Maxim I. Alexeenkov
STUDYING THE CAPABILITIES OF NEURAL NETWORKS FOR ADAPTIVE DRIVER ASSISTANCE SYSTEMS...279

S.V. Varshavskiy, M.M. Nikitaev, Yu.E. Vasiliev, K.A. Barinov, K.V. Mikolaichuk
INTELLECTUALIZATION OF THE PAVEMENT DEFECT RECOGNITION PROCESS...283

Dmitriy Volgushev, Grigoriy Fokin
LINK LEVEL SIMULATION MODEL FOR VEHICLES WITH LOCATION-AWARE BEAMFORMING IN 5G MM WAVE ULTRA-DENSE NETWORKS...289

A.V. Volosova, P.F. Yurchik, V.B. Golubkova, B.S. Subbotin, A.V. Vasiliev
USING A DIGITAL TWIN IN ULTRA-LARGE-SCALE SYSTEM...296

A.I. Vorobyev, M.V. Gavrilyuk, T.V. Vorobyeva, D.Yu. Morozov, A.M. Iliushin
APPLICATION OF ITS RESEARCH LABORATORIES IN THE FIELD OF COOPERATIVE SYSTEMS...301

I.O. Yablochnikova, S.L. Yablochnikov, K.A. Makhiboroda, V.B. Dzobelova, T.A. Doguchaeva
MODELING OF E-LEARNING PROCESSES...305

Marina V. Yashina, Vyacheslav A. Shein
MOTION PLANNING OF 2D WHEELED MOBILE ROBOT USING REINFORCEMENT LEARNING...311

S.V. Zhankaziev, A.I. Vorobyev, A.V. Zamytskih, P.V. Harbunou
RAISING AWARENESS OF DRIVERLESS CARS AT CLOSED INTERSECTIONS USING URBAN INFRASTRUCTURE, MACHINE VISION TECHNOLOGIES AND V2X SHARING...315

A.P. Zhuravlev
MODULAR SOFTWARE ENVIRONMENT FOR DISTRIBUTED SDR SYSTEMS...320