WORLD OF TRANSPORT AND TRANSPORTATION
Vol.13 (2015), Issue 4

IDENTIFICATION OF CHAOTIC PROCESSES IN TRANSPORT SYSTEMS

Cherneva, Galina Petkova

pp. 6 – 15

This paper proposes a methodology for identification of chaotic processes, which can be applied in the research of any dynamical system, including transport systems. A three-dimensional system is considered, which describes the dynamics of a specific transport process. On the basis of the proposed algorithm a research has been performed in the environment Mathcad with different values of parameters and initial conditions. The considered approach creates a possibility to manage nonlinear transport system, so as to ensure the desired operating mode.

Keywords: nonlinear dynamic systems, transport system, chaotic processes, phase portrait, chaotic attractor, identification algorithm.

SELECTION OF COORDINATE AXES FOR EVALUATING VIBRATIONS OF THE CAR WITH STAGGERED CARGO

Anisimov, Peter S.

pp. 16 - 23

A method of selecting coordinate axes is proposed for the study of spatial vibrations of a freight car with heavy or oversized cargo. The suggested method uses the technique of academician G. K. Suslov. The system of equations is considered for determining main central moments of inertia of cargo of different weight depending on longitudinal and transverse displacements from axes of car's symmetry.

Keywords: railway, freight car, heavy solid cargo, coordinate axes, inertia axes, central moments of inertia, method of coordinate axes determination, system of equations.

PHYSICAL PROPERTIES OF OBJECTS OF 3D-STATION ENGINEERING MODEL

Golovnich, Alexander C.

pp. 24 - 34

The article considers features and fundamental difficulties of implementing 3D-station engineering model. The analysis of methodological and situational difficulties is focused on causes associated with insufficient knowledge about nature of physical laws' action and complexity of model reproduction of effects of interaction between objects of rolling stock and railway track. Approaches to simulation of physical and technological processes for construction of adequate real-world images are highlighted to be further developed.

Keywords: railway, 3D-station, laws of physics, design, modeling, simulation, gravity forces, elastic forces, friction forces, cumulative effect.

DEPENDENCE TO CALCULATE ADHESION FRICTION COEFFICIENT

Scheviev, Yuri L., Titarenko, Evgeny A.

pp. 36 - 42

The studied topic is determined by a need to have reliable traction calculations that consider friction forces in between wheels and rails as well as traction weight of a locomotive.

To test proposed approaches to the solution of the problem the authors put forward a universal formula to determine adhesion coefficient and a technique to compare calculated values of the coefficient with the values of known empiric dependences for rail bus RA-1.

Keywords: railway, rails, wheel, locomotive, adhesion coefficient, acting forces, rail bus acceleration, choice of options, mechanics.

CROSSING OVER NEVELSKI STRAIT: POSSIBLE SOLUTIONS

Kruglov, Valery M., Kurbatskiy, Evgeny N., Hoppe, Vitaly R., Tomilov, Anton A.

pp. 44 - 53

Continuing research that has been conducted by Russian leading transport universities for many years on prospects of development of railways and roads of eastern direction [1] in Russia, the authors propose a solution to the problem of transport crossing over Nevelski Strait from the mainland to the island of Sakhalin. Options and approaches are justified, the alternative «bridge–tunnel» is evaluated, suggesting projects with a high degree of engineering elaboration, environmental safety, economic readiness and investment responsibility.

Keywords: transport crossing, sea strait, Sakhalin Island, Nevelski strait, tunnel, bridge, geotechnical conditions, design alternative, railways.

3D-PRINTING TECHNOLOGY FOR AERODYNAMIC MODELS OF ROCKET AND SPACECRAFTS

Kulikov, Mikhail Yu., Larionov, Maxim A., Gusev, Denis V.

pp. 54 – 57

The article briefly evaluates the use of 3D-printing to create size-similar models of rocket and spacecrafts' elements suitable for conditions of aerodynamic ground testing. The practices of NASA regarding generative technology for aerodynamics simulation are considered. The authors built a model using AGARD calibration models, 3D printer Ultra 2 of EnvisionTEC, Digital Light Processing (DLP) and photopolymer HTM-140. Next described step was model's fault detection and analyze of roughness of surface layer. The results obtained enable to conclude on the potential of Digital Light Processing (DLP) technology and photopolymer HTM-140, their ability to meet the requirements for not only sub- and transonic modes in a wind tunnel, but also hypersonic.

Keywords: rocket and spacecrafts, aerodynamic model, prototyping, 3D-printing technology, ground tests.

FEATURES OF FREIGHT CARS OPERATION WITHIN THE RAILWAYS OF MYANMAR

Voronin, Nikolai N., Voronin, Nikolai N. (Jr.), Zin Aye Min, Yangon

pp. 58 - 71

Needs for freight transportation, which increased in the period of serious political and economic reforms, which began in 2011, demanded from the government of Myanmar to carry out systemic changes in transport sector. Long-term programs of railways' modernization, strengthening of their resource base and technical equipment were taken. Within the expected changes the authors analyze the condition of country's rolling stock fleet, features of its use. At the same time as a separate characteristic problem wear of center plate arrangement depending is considered regarding different types of freight cars.

Keywords: transport system, railway, Myanmar, freight cars, center plate, center pad, contact pressure, wear.

ASSESSMENT OF LOCOMOTIVE SERVICE LIFE BASED ON EVALUATION OF FATIGUE STRENGTH

Grigoriev, Pavel S.

pp. 72 – 78

Using data on daily run, dependence was constructed, showing how the intensity of locomotive's operation influences its performance, the time of operational readiness prior to emergence of fatigue damage in the bearing structure. On the basis of applied approach tentative lifetime of TGK2 shunting locomotive was assessed using an example of a calculation of a bearing part.

Keywords: railway, shunting locomotive, service life, bearing structure, fatigue strength, residual life.

MEASURING METRO TRAIN'S SPEED BY ON-BOARD OPTICAL SENSORS

Starovoitov, Evgeny I., Vorobiev, Sergey A.

pp. 80 - 93

The optical methods of measuring the speed of trains in metro by onboard sensors are studied, including situations of train's approach to another object. In solving these tasks the experience of the development of opto-electronic devices for probable future spacecrafts is used. It is shown that the smallest measurement uncertainty is provided by considering the effect of geometric distortion of the image formed by CMOS photodetector. The sensors are able to fulfill the role of reserves in the system of automatic train control, thereby enhancing reliability and safety of passenger tr affic.

Keywords: metro, train, speed, measurement, optical sensor, CMOS.

POWER SUPPLY SYSTEM OF AUXILIARY MACHINES OF ELECTRIC LOCOMOTIVES WITH BALANCING OF THREE-PHASE VOLTAGE

Litovchenko, Viktor V., Malyutin, Artem Yu.

pp. 94 - 98

The article critically evaluates the current system of splitting a single-phase alternating current into a three-phase current, applied on Russian freight electric locomotives of alternating current to power auxiliary circuits. The drawbacks of this

system are shown, particularly it was found that the low quality of supply is a major reason for the high number of failures of auxiliary machines and methods used to solve existing problems are not characterized by high efficiency and ease of implementation. The variant is offered, which allows significantly reducing the number of failures using to static phase splitter.

Keywords: railway, electric locomotive, auxiliary machines, power supply system, AC, phase splitter.

SERVICE QUALITY SHOULD BE ASSESSED BY THE CLIENTS THEMSELVES

Sokolov, Yuri I.

pp. 100 - 109

The article presents an analysis of the dynamics of the level of transport service quality of cargo owners based on data obtained in the framework of the project «Quality Index». Current trends and their causes are identified. The basic challenges to continuous improvement of service quality rendered by the railways of Russia are formulated.

Keywords: railway, transport, economy, quality, cargo owners, transport service, infrastructure, quality index.

STRATEGY AS A TOOL OF CORPORATE ECONOMIC MANAGEMENT

Eremeev, Dmitry O., Kozhevnikov, Ruslan A., Podsorin, Viktor A.

pp. 110 - 124

The article describes the content of transport company development strategy, current trends of the transport market, innovation, investment, regional components of the strategy, provision of company's economic security. A three-component index of financial state if a company is suggested, permitting to assess its comformity with requirements of economic strategy.

Keywords: strategy, development, transport company, innovation policy, investment policy, economic security, financial stability.

ECONOMIC CHOICE OF PARAMETERS OF HYBRID LOCOMOTIVES' POWER PLANT

Kalugin, Sergey P.

pp. 126 - 136

The article is devoted to the choice of parameters of hybrid locomotive's power plant (primary source power and energy storage capacity) by the criterion of maximum economic efficiency. Since it is the use of energy storage device having a high market value, stimulates the search for rational costs for equipment, study the possibility to provide the most favorable ratio of performance, including through the analysis of development and consumption of energy by a diesel engine.

Keywords: autonomous transport, locomotive, hybrid power plant, energy storage, value, costs, cost-effectiveness, optimization of parameters.

DEVELOPMENT SCENARIOS FOR LAND TRANSPORT OF RUSSIAN NORTH-EASTERN EUROPEAN AND NORTHERN TRANSURAL AREAS

Kiselenko, Anatoly N., Malashchuk, Petr A.

pp. 138 - 153

Land transport plays a key role in transportation of goods and passengers in Russian northern areas. Evaluation of its condition helps to determine the possibility of functioning of a region's economy and social sphere. Existing land transport network does not provide enough connectivity of considered territories to each other and restricts access to foreign markets. Implementation of scenarios, presented in this paper, suggests creating a reference frame of the transport network, which can be used to solve accumulated problems in the northern zone.

Keywords: land transport, Russian North-Eastern European area, Northern TransUral area, transportation, regional needs, dynamics, analysis, development scenarios.

AUTOMATION OF OPERATIONS SCHEDULING OF METRO ELECTRIC ROLLING STOCK

Sidorenko, Valentina G., Safronov, Anton I., Filipchenko, Constantine M.

pp. 154 - 165

The authors consider issues of automation applicable to scheduling turnaround of metro electric rolling stock, organization of its individual stages. Complementing theoretical analysis of interaction of processes, data exchange organization, optimal algorithm searching, an algorithm for automated appointment of rolling stock maintenance of the first volume as well as supporting software are developed and proposed which are now tested. Attributes of the line are determined, affecting algorithm implementation, at the example of the Moscow Metro

Keywords: metro, electric rolling stock, process, automation, planned traffic schedule, turnaround schedule.

GENERAL APPROACH TO MODELING OF PEDESTRIAN FLOWS

Yakimov, Mikhail R.

pp. 166 - 173

The author considers two approaches to modeling and analysis of pedestrian behavior in typical urban environment. One approach is based on civil engineering, the other one is focused on urban geography. Those two approaches are described by four models of pedestrian behavior, which are described respectively by physical and mathematical terms, by multi-agent, cellular automata, and queuing theory. A description of each of them is given, the specifics of the application are described, and examples of models implementation in software products are provided.

Keywords: modeling, traffic management, pedestrian flows, patterns of pedestrian behavior, civil engineering, urban geography.

STRUCTURE AND FUNCTIONS OF INTER-REGIONAL TRANSPORT SYSTEMS

Tararychkin, Igor A.

pp. 174 - 189

A method for analyzing the properties of inter-regional transport systems is developed, based on determining the quantitative composition of required structural levels. It is proposed to conduct optimization of functioning of such systems consistently at every set level and taking into account the peculiarities of interaction between individual elements.

Keywords: transport system, structure, cluster, junction, freight traffic, transit.

BUS FOR PASSENGERS WITH BICYCLES ON THE RING ROUTE OF HANOI

Ryabov, Igor M., Nguyen Thi Thu Huong, Danilov, Sergey V.

pp. 190 - 199

The buses, which are equipped with special racks for bicycles, are proposed to be deployed in Hanoi and which can be called «velobuses» («bicycle-carrying buses» or «bicycle-buses»). This innovation will reduce traffic intensity in the city and improve safety on roads due to the greater attractiveness of bus routes. The article provides justification for the number of seats in the bus for passengers with bicycles (it takes into account projected passenger traffic in Hanoi) and a description of the design of racks for temporary storage of bicycles during their transportation inside the bus.

Keywords: urban transport, bus, transportation of bicycles.

ROUTES FOR THE EURASIAN ECONOMIC UNION

Fedorov, Lev S., Sabitov, Izzat H.

pp. 200 - 208

Analysis of inner corridors of the national railway network in Kazakhstan, on the basis of which EurAsEC transport routes are formed, is provided. Along them the bulk of cargo and passenger transportation in all kinds of messages is carried out. It is noted that among the main problems there is a high degree of wear of tracks, significantly reducing trains' speed, as well as a large number of single-track sections, limiting the capacity of lines operated. The article indicates directions for development and improvement of the railway infrastructure requiring urgent investment.

Keywords: EEC, railways, cargo transportation, international transport corridors, infrastructure, speed, capacity, investments.

TOPICS OF THEORETICAL PHYSICS IN UNIVERSITY DEPARTMENTAL RESEARCH

Antipenko, Vitaly S., Kokin, Sergey M., Lyapushkin, Nikolai N., Nikitenko, Vladimir A.

pp. 210 - 217

The article reviews researches, conducted by the department of physics of Moscow State University of Railway Engineering (MIIT), the results of which can be

used or are being used in the transport sector, namely with regard to: 1) development of optimization models regarding types of trucks; 2) improving design and creation of new types of electroluminescent indicators; 3) refinement of wheel-rail contact theory. General conclusion proposed by the authors and concerning practices of rail related studies is that physics plays one of the most important roles in teaching and learning processes, as well as in conducting a wide range of researches in a transport university.

Keywords: transport, car, railway, aviation, stochastic model, algorithm, type, energy saving, lighting, electroluminescent light sources, wheel-to-rail adhesion

CORPORATE EDUCATIONAL SYNTHESIS TECHNOLOGIES OF PERSONAL AND CORPORATE DEVELOPMENT OBJECTIVES

Zaytseva, Alyona V.

pp. 226 - 232

The article raises issues of relationship between corporate and individual development objectives, showing the role of corporate educational environment for their rapprochement. Specific mechanisms, tools and technologies that promote and ensure implementation of individual development plans of managers, representing key staff category essential for the success of reforms and corporate strategic development, were analyzed at the example of JSC Russian Railways.

Keywords: life-long education, corporate education and training, competence, educational technology, educational environment, individual development.

RAY OF LIGHT IN ELECTRONIC REALM

Grigoriev, Nikolai D.

pp. 234 - 247

His monument was installed two years ago near Ostankino TV center in Moscow. And it is a sign of merits' recognition of Vladimir Zworykin, and a whole galaxy of other Russian scientists and engineers, who for years had helped to create a modern television as a unique communication system that creates the effect of viewer's presence anywhere in the global information space. The author describes main stages of life, collisions of unusual fate of the famous electrical engineer, awarded the unofficial title of honored Russian American.

Keywords: telecommunications, television, history, electrical engineering, Zworykin, innovative heritage.

OBSTACLE JUNCTION

Kritsky, Sergey V., Letyukhin, Ivan D.

pp. 248 - 258

The article reveals a little-known chapter in the history of Murmansk railway. It is timed to the 100th anniversary of the construction of the Northern mainline. The article describes an attempt of Murmansk residents in the years 1920-1930 to establish their own independent rail access to Petrograd (Leningrad) junction, and to organize in the city their own main passenger (with a terminal station) and freight stations in the best possible way to process their cargo and passenger traffic, regardless of other railway infrastructure, forced interaction with which did not always have a positive effect on the organization of transportation process.

Keywords: railway, history, infrastructure, station, development vectors, Murmansk, Petrozavodsk, Northwest.

HIS WORK WAS APPALLINGLY ENORMOUS

Vladimirov, Yuri V.

pp. 264 - 268

REVIEW OF THE BOOK: Chukarev, A. G. General of railways of the Empire. To the 210th birthday anniversary of the first Minister of Railways Pavel P. Melnikov (1804-1880). Moscow, EMC on education for railway transport, 2014, 328 p.

ABSTRACT OF THE BOOK. The book is dedicated to life and work of Pavel Melnikov, a prominent transport engineer, a talented scientist who laid foundations of railway science, a statesman and a patriot of his country. In the author’s interpretation of biographical material emphasis is put on high professional and civic qualities of the character, his integrity and selfless service to the cause. The story is accompanied by portrait sketches of significant persons of that time and an indication of used extensive source and reference apparatus. The book is addressed to a wide range of readers who are interested in the history of Russian railways.

ABSTRACT OF THE REVIEW. The book under review plays a role of a synthesizer of all materials, written during two centuries, about Pavel Petrovich Melnikov, an extraordinary man, with a strong moral core and a great engineering talent. The material allows not only to dissect in detail biographical outline, chronology of scientific and practical activities of «chief of railways» of tsarist Russia of the period of railway emergence, but also to highlight in detail human parameters of the hero of the narrative, his strengths and weaknesses, successes and failures in the professional career. The skill of a collector and interpreter was to still mark its presence, to add some color to portrait (the character of the hero) and

landscape (ambient reality). The review takes an attempt to generalize the most characteristic qualities of Melnikov, professional and individual ones as well. However the author of the review puts forward questions on to what extent some features of Melnikov's policy might be considered legitimate and valid nowadays regarding the role of state in development of railways infrastructure, investment and operations.

Keywords: railway, history, Melnikov, the Russian Empire, Minister of Railways, first railways, railway construction.