

UNIVERSITY OF ZILINA



TRANSCOM 2019

13th international scientific conference of young scientists on sustainable, modern and safe transport

under the auspices of

Jozef Jandacka
Rector of the University of Zilina

BOOK OF ABSTRACTS

High Tatras, Grand Hotel Bellevue
29 - 31 May 2019
Slovak Republic

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PREFACE

TRANSCOM 2019, the 19th international scientific conference of young European scientists, doctoral students and their tutors, aims to establish and expand international co-operation and contacts. The main purpose of the conference is to provide young scientists with an encouraging and stimulating environment in which they present results of their research to the scientific community. TRANSCOM has been organized regularly every other year since 1995. Between 160 and 400 young researchers and scientists participate regularly in the event. This conference is great occasion for PhD students and young scientists to present their research outputs and results and to exchange their scientific experiences.

Topics of TRANSCOM 2019 are focused on transportation

- 1 Materials in Transport
- 2 Technology in Transport
- 3 Construction in Transport
- 4 Economics and Management in Transport
- 5 Informatics and Safety in Transport

The conference is organized by the University of Žilina, located in the North of the Slovak Republic, with about 9 000 graduate and postgraduate students. The university offers Bachelor, Master and Doctoral programmes in the fields of transport, telecommunications, management, information systems, mechanical engineering, civil engineering, electrical engineering, special engineering, forensic engineering, social sciences and in natural sciences.

The 13th international scientific conference of PhD students and young scientists on sustainable, modern and safe transport TRANSCOM 2019 was held under the auspices of prof. Ing. Jozef Jandacka, PhD., Rector of the University of Zilina.

This TRANSCOM 2019 conference takes place in High Tatras, Slovak Republic on 29. – 31. 5. 2019. On this conference, 227 papers by scientific researchers and PhD students were presented.

Full conference papers will be published by Elsevier in a Procedia series journal entitled Transportation Research Procedia.

Guest editors

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All papers were reviewed by two reviewers.

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TOPIC 5 INFORMATICS AND SAFETY IN TRANSPORT

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Topic 1 MATERIALS IN TRANSPORT

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Changes in internal damping of selected types of austenitic stainless steels

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Abstract

The paper is focused on internal damping of three different types of austenitic stainless steels—exactly AISI 304, AISI 316L and AISI 316Ti. There was observed temperature dependence of internal damping of mentioned steels; each specimen was measured in a temperature range of 25 °C to 400 °C. The measurements were performed on samples in their initial state and in the state after recrystallization annealing. Correct interpreting of the changes in internal damping can bring a lot of important information about the changes taking place in the structure of the materials. Temperature changes allow the study of precipitation processes, recrystallization and the dissolution processes of some structural components.

Keywords: austenitic stainless steel; internal damping; temperature dependence.



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The natural aging behavior of the AA 2055 Al-Cu-Li alloy

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Abstract

The Al-Cu-Li alloys are of the interest of many aircraft engineers, as they are superior to conventional Al alloys, used in the aircraft industry. The AA 2055 alloy exhibit an outstanding combination of mechanical properties, the high modulus of elasticity and the low density. Even those alloys are standardly used in the artificial aged conditions; the natural aged state can show significant improvement in the ductility, sacrificing some of the strength. In the presented paper, the natural aging behavior of the AA 2055 alloy is characterized, in terms of the mechanical properties and thermodynamic stability.

Keywords: natural aging, Al-Li alloys, alloy 2055,



The Inconveniences Related to Accelerated Thermal Ageing of Cables

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Abstract

For the purpose of reliability estimation and lifetime determination, electrical equipment is often accelerated aged according to Arrhenius approach. The correct setup of accelerated thermal ageing is a very difficult process where the key problem is the correct determination of the ageing temperature that has to be in accordance with the used materials. Due to time and economic demands, the tendency is to accelerate the ageing process as much as possible. In this paper, it is described practically problems that happen during cable accelerated thermal ageing if the ageing temperature is disproportionately high.

Keywords: Arrhenius approach; cable; thermal ageing



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Selected Properties of the Micro Electrical Discharge Alloying Process Using Copper Electrode on Aluminum

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Abstract

The paper presents a study of surface layers produced by electro-spark deposition (ESD) using copper electrode on the aluminum. The layers were investigated with metallographic methods. Microscopic examination was carried out to examine the structure of formed layers. Image analysis methods were used to observe the cross-section of the layer. For diffusion observations, ESD analyzes were performed on the cross-section of the produced layer. Scanning electron microscope (SEM) and energy-dispersive X-ray spectroscopy (EDX) analysis was conducted to characterize the microstructure and composition of the coating. Also the tribological tests were made on the T-01 M type Ball-on-Disk testing machine. The research carried out for a sliding distance of 1000 m with load 10 N. The results of investigations showed that there is a possibility of obtaining the satisfying quality superficial layer on the aluminum using copper electrode.

Keywords: ESD, ESA, surface layer, tribological tests



Corrosion degradation of AZ31 magnesium alloy coated by plasma electrolytic oxidation

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Abstract

Influence of plasma electrolytic oxidation (PEO) coating prepared using DC current technique on corrosion resistance of AZ31 magnesium alloy was studied. Morphology and chemical composition of the PEO coating was evaluated by scanning electron microscopy and EDS analysis respectively. Corrosion characteristics of ground and PEO coated samples were measured using electrochemical impedance spectroscopy (EIS) in 0.1 M NaCl. Scanning Kelvin Probe (SKP) technique was employed in order to investigate degradation mechanism of PEO samples after 24 h of salt spray test (NSS acc. to STN ISO 9227). Results showed that except of improved corrosion resistance of PEO coating, change of degradation mechanism was noticed after salt spray test.

Keywords: magnesium alloy, corrosion, plasma electrolytic oxidation, Scanning Kelvin Probe



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Analysis of insulation properties of transformer materials at different ambient temperatures

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Abstract

The first part of paper deals with the base information about diagnostics of power transformers. The second part of paper deals use of method of frequency domain spectroscopy (FDS) for traction transformer. This method is used in analysis insulating condition and its solution has scientific importance for analysis of power transformer with system of oil-paper. It was found, that the results of these tests are highly impacted by the operating temperature during the experimental measurement. Finally, the paper presents experimental results of this diagnostic measurement for a real traction transformer at different operating temperatures and states (with oil and without). It has been found, that moisture and conductivity between paper and oil in an insulating system are highly dependent from temperature.

Keywords: diagnostics; frequency domain spectroscopy; transformer; temperature



The experimental analysis of engine oil degradation utilizing selected thermoanalytical methods

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Abstract

In the paper, the authors raised the problem of degradation of lubricating oil parameters with extended intervals of oil change of a passenger car. The results of engine oils thermoanalysis are presented and discussed. The analyzed oils were brand new and worn out after the mileage of 30 000 kilometers. The goal of the paper was to indicate the differences between new and worn out oil and to point the problems associated with further extending oil change intervals.

Keywords: differential scanning calorimetry; thermogravimetric analysis; engine oil



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Different Ways to Improve Natural Ester Oils

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Abstract

The issue of natural esters as a substitution for mineral oils is more complicated than it seems. The first impulse for this substitution rose up as a demand for environment-friendly transformer oil. The case of fault of the transformer with mineral oil represents severe damage to the surrounding area. This would be minimized with the usage of biodegradable natural ester oil.

The category of natural esters offers a wide range of possibilities. These oils have an advantage of local manufacturing by the available local oil plant. In our area it is sunflower and rapeseed oil. Research presented in this article covers various areas concerning the development process of new biodegradable liquid usable in distribution transformers. This includes the process of choosing the base oil, testing of operation conditions of its properties, finding ways to improve imperfect properties through additives like antioxidants and possible benefits of the addition of nanoparticles. Various problems in this area were tackled and detailed results (mostly of electrical but also chemical parameters) are presented with basis on the chemical composition of tested materials.

Keywords: natural ester; insulation oil; fatty acids; oxidation; antioxidants; nanoparticles



Quality management systems in special processes

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Abstract

The paper presents the method of special process supervision concerning semi-trailer structures welding by the quality management systems implementation and application of criteria paradigm. Special processes supervision consists of activities leading to obtaining a finished product that meets certain quality conditions. The paper presents examples of applied solutions based on the quality management through manufacturing processes management with special emphasis on special processes resulting in obtaining a product that fulfil customer requirements.

Keywords: quality management; special processes; welding; semi-trailer



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Analysis of dependence of internal damping on temperature of austenitic steels AISI 304 and AISI 316L

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Abstract

The article is focused on the analysis of dependence of internal damping on temperature of austenitic steels. The ability of a solid to irreversibly disperse energy under mechanical stress is called the internal damping. The time required to achieve the equilibrium deformation value is determined by various processes associated with the reallocation of atoms, magnetic moments and the temperature of the solid subjected to external stresses.

Measurement of internal damping dependence on temperature was performed on austenitic steels AISI 304 and AISI 316L, in the initial state and after the deformation. Those materials are the most important group of corrosion-resistant metallic materials, which are very often used in industrial.

Significant future growth is foreseen in the use of stainless steel for key structural components in automotive construction. Due to its unique mechanical properties, stainless steel can add an extra dimension of passenger safety, especially in the way that a large part of the energy produced in a collision is absorbed as the material deforms under impact. This property is already put to good effect in the design of modern large passenger vehicles such as buses, but the future potential in all types of road vehicle is immense (www.worldstainless.org).

Keywords: austenitic steel; internal damping; temperature; resonance frequency; applications in the automotive industry



Microstructure and fatigue performance of SLM-fabricated Ti6Al4V alloy after different stress-relief heat treatments

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Abstract

The main interest in Additive Manufacturing (AM) technology relates to its ability to produce complex components with relatively reduced weight that are difficult to produce or cannot be produced by other conventional technologies. Selective laser melting (SLM) is extensively used, as one of the AM technologies to fabricate metallic parts. This advanced method allows to produce various parts with complex geometries with high three-dimensional (3D) accuracy from fusion powders in a layer-by-layer style. Ti6Al4V alloy is a widely used material for structural applications in aerospace and biomedical due to high specific fatigue strength. SLM processing makes this alloy attractive when weight reduction is a design objective. The SLM Ti6Al4V microstructure is influenced by process parameters and build orientation. The localized high energy input during very short interaction times leads to the formation of very fine structures and to the generation of internal stresses. Therefore, the SLM parts are heat treated to decrease or completely remove residual stresses. The present study aims at evaluating the effect of stress-relief heat treatments on the microstructure, the mechanical properties and the fatigue performance of SLM Ti6Al4V alloy. Ti6Al4V alloy specimens were manufactured according to the SLM process with an EOS M290 system. Post fabrications heat treatments at different temperatures (i.e. 740°C vs. 900°C) resulted in different structure and mechanical properties that were identified and measured. Fatigue testing of specimens with as-built surfaces was performed at room temperature on modified Schenk-type fatigue testing machine applying a pulsating plane bending (load cycle ratio $R = 0$) to the specimens at a frequency $f = 15$ Hz.

Keywords: Additive manufacturing; Selective laser melting; Ti6Al4V; Microstructure, Heat treatment; Fatigue



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Characteristics and investigation of selected manufacturing defects of passenger car tires

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Abstract

Car tire is an interface between vehicle and road, thus plays a major role in vehicle dynamics. Any imperfections and defects have negative effect on vehicle handling and safety. Unfortunately, certain number of new tires put on the market is not free of defects. In best case the defects would have only influence on comfort, however in the worst case they can cause an accident. The paper analyzes selected tire defects and its causes that may arise during manufacturing process. Tire construction and materials used for its production were also discussed.

Keywords: tire; manufacturing; defects; non-uniformity



Analysis of influence of bitumen composition on the properties represented by empirical and viscosity test

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Abstract

Bitumen are one of the products in oil processing. The properties of bitumen are influenced by the source of oil itself and by the technological process of oil processing. Most European refineries, of course, are processing for reasons of the resale of petroleum products, especially petroleum suitable for the recovery of light and middle fractions. Therefore, light petroleum are required, with low yields of heavy fractions which are highly economically and in dispositions efficient for processors on the petroleum market. From the perspective of the refinery the content and the ratio of asphaltenes and maltenes as essential components of bitumen become less important, however, this can significantly impact on future properties of the bituminous binder. The basic tests as penetration and softening point are dedicated to evaluate the bitumen properties and classify the bitumen. These tests are currently insufficient and therefore new test methods and procedures for bitumen characterization are developed. The main theme of the performance-based approach to bitumen binders' properties assessment is the evaluation of properties from the pavement performance point of view as permanent deformation, fatigue and frost cracking. The evaluation of changes of bitumen properties during the production and paving process of the asphalt mixture is also important. The study is focused on investigating the viscous-temperature behavior and fundamental properties represented by the penetration and the softening point of the samples of paving grade bitumen 50/70 and polymer modified bitumen PMB 45/80-75. The composition of the bitumen was determined by the SARA analysis and organic elemental analysis. The paper points out how the "traditional" tests as softening point, penetration, and viscosity are affected by the composition of bitumen and how the composition of bitumen changes the basic properties of bitumen.

Keywords: bitumen, empirical test, composition of bitumen, dynamic viscosity



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Application of TDR Test Probe for Determination of Moisture Changes of Railway Substructure Materials

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Abstract

The initial part of the paper characterizes a non-destructive TDR (time domain reflectometry) method for measuring moisture. This method is used to identify the moisture changes in the materials incorporated in the structural layers of the railway models built at a 1:1 scale (experimental stand DRETM). The subsequent part specifies the procedure for calibrating the TDR probe for selected building materials composing the measuring profiles of the experimental stand (Liapor fr. 1/8 mm, sand and crushed aggregate fr. 0/31.5 mm).

The result of the TDR probe calibration is the calibration curves for the tested building materials, which can be used to identify the real moisture values in the railway line structure, in any season. The specified moisture values represent the necessary inputs for the numerical modeling of the non-traffic load (climatic factors) on the railway line using the SoilVision software.

Keywords: track bed, moisture, time domain reflectometry, test sample, calibration curve.



Experimental measurement of environmental actions on structural steel members

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Abstract

Increased activities of the environmental actions become the worldwide problem considerably influencing serviceability of the engineering constructions. Aggressive environmental causes the massive material degradation of constructions, therefore it is necessary to predict their influence on reliability and mainly durability of structures. Corrosion aggressiveness of the atmospheric environment is classified by the corrosion rate represented by the thickness losses of structural steel leading to decreasing the resistance of steel bridge members. This paper presents the research of corrosion characteristics of steel bridges, and results of experimental measurements in-situ.

Keywords: corrosion; structural steel; corrosivity of atmosphere



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Electronic nose for smart identification of roofing and paving grade asphalt

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Abstract

Asphalt is a complex mixture of hydrocarbons, whose properties strongly depend on the source and type of crude oil and refining processes. From a technical standpoint, intensive investigations carried out by the construction sector, above all by road researchers, have attempted to understand relationships between asphalt binder chemical structure, morphology and physical characteristics. Nevertheless, one challenge that the advance research on asphalt products actually face is to transfer this extremely high level of knowledge to applied industrial technologies for finding easy-to-use, quick and cost-effective test methods for quality control and identification of asphalt binders at refinery, terminal and plant. Thus, this paper focused on the development of a protocol for fingerprinting, including identification and discrimination, of asphalt cements using two different electronic noses (e-noses), also known as artificial olfactory systems (AOS). E-nose is a biomimetic non-destructive intelligent sensing instrument, which is designed to mimic the human sense of smell to detect, compare and classify odor sample, producing a qualitative output (fingerprint). Results suggested that a complementary combination of electronic nose technique and well-established analytical methodologies could be successfully used for the identification and discrimination of roofing and paving grade asphalt cements. Specifically, both sensing instruments were able to perform a good discrimination between products characterized by a different chemical nature and to verify the refinery process stability during production and a batch-to-batch crude oil consistency.

Keywords: Pavement engineering, e-nose, asphalt binder, bitumen, asphalt plant



Efficiency of blast walls for protection of soft targets

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Abstract

The recent trend of terrorist attacks on civilian targets, including transportation systems, resulted in efforts to harden and strengthen these objects which previously were not designed to cope with this kind of threat. The blast mitigation strategies traditionally used in industrial facilities may provide an additional safety. One such solution is a blast wall that could be used for façade systems or for protection of muster areas and evacuation routes of metro and train stations or airports.

This paper deals with the assessment of the blast response of protection walls. The typical types of blast walls commonly used in practice in industrial sector are described. The behavior of blast walls is characterized using simple analytical approach and finite element modelling. The advantages and limitations related to each of these characterization techniques are discussed compared with findings of other authors. Furthermore, a parametric study is performed through extrapolation of numerical models. Two common types of panels with both fixed and pinned boundary conditions are subjected to directly defined pressure loads. Their responses are compared in order to evaluate the effects on the primary steelwork. Possible benefits deriving from typological and geometrical modifications of the local element are also presented. Particular emphasis is given to the importance of the estimation of the reaction forces, displacements and energy dissipation.

Keywords: soft targets; blast response; blast walls



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The Influence of ZnO nanoparticles in the epoxy resin on the complex permittivity and dissipation factor

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Abstract

Epoxy resins are used as electro-insulating materials because they have great electro-insulation properties, adhesion, chemical resistance, and minimal shrinkage during curing. Epoxy nanocomposites have gained much interest in the area of nanotechnology, because of the ease of manufacture and the significant gain in properties. The influence of the various concentration of ZnO nanoparticles in epoxy resin Vukol 022 on the changes of the complex permittivity and dissipation factor has been measured at the temperature range from 20 °C to 120 °C. Frequency dependences of these parameters were measured within the frequency ranges from 1 mHz to 1 MHz by a capacitance method. The 0,5 wt.% nanoparticles caused a decrease of the real part of the complex relative permittivity. The higher concentration of nanoparticles for frequencies above 10 Hz had higher real relative permittivity as pure epoxy resin. At the study of the influence of temperature on dissipation factor, α -relaxation process and its shift to lower frequencies with ZnO fillers were observed.

Keywords: epoxy resin, nanoparticles, permittivity



Analysis of microstructure in AlSi7Mg0.3 cast alloy with different content of Fe.

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Abstract

The use of recycled alloys brings potential energy savings, and generates less CO₂ emission compared to primary aluminum production, but it is necessary to take into account their specific properties. The properties of the secondary aluminum alloys are comparable to primary alloys, but important attention must be paid due to the higher iron content. Iron with the presence of other elements in the alloy creates intermetallic compounds which have negative influence especially on the mechanical properties. It is impossible to remove iron from melt by standard operations. Some elements eliminates iron by changing iron intermetallic phase morphology, decreasing its extent and by improving alloy properties. Therefore, the effects of different content of Iron (Fe) on the microstructure and the morphology of the intermetallic iron phases of AlSi7Mg0.3 alloy casted in to the sand molds were investigated. For influencing their morphology formation the heat treatment T6 (according standards) and addition of Manganese (Mn) were used in some bars. 2D and 3D metallographic and image analysis have been performed to measure the microstructural changes occurring at different Fe, Mn levels and heat treatment conditions. The study confirms that T6 have influence on to size of Fe-rich phases (especially in needles form), but the increasing length of Fe-needles intermetallic phases with increasing content of Fe did not by confirmed.

Keywords: secondary aluminium alloys, Fe intermetallic phases, ratio of Fe and Mn, heat treatment of aluminium alloys, quantitative analysis



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Authors are responsible for language and content of their abstracts.



New knowledge in the field of the diagnostic and evaluation of selected pavement parameters

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Abstract

This paper presents new knowledge in the field of diagnostic of building objects. The paper focuses primarily on the issue of obtaining input data to evaluate building objects in order to take a decision. It focuses primarily on the results of experimental measurements of selected parameters of building objects by non-destructive diagnostics. The paper presents a detailed evaluation of the field work done for the collection of selected technical data and their processing. The paper also shares knowledge of the possible dependence of the GNNS map signal on the accuracy of the measurement.

Keywords: pavement performance; diagnostic device; PMS;



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Analysis of the cause of the girth gear tooth fracture occurrence at the bucket wheel excavator

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Abstract

Premature damages and fractures of components and structures of bucket-wheel excavators at open-pit mine often occur in exploitation, caused either by inadequate design or insufficient knowledge of the material properties, welded joints and flaws in component production technology. The bucket-wheel excavator, TAKRAF SRs 2000 × 32/5.0 was employed on the excavation of barren soil for 5.000 h (a few weeks more than a year after the assembly) when the fracture of the tooth of the girth gear, which enables the circular motion of the upper structure of the bucket-wheel excavator, occurred. The gear was, according to the manufacturer's certificate, made of the cast steel GS 40 MnCrSi3 V. The paper presents calculations of the stress variations cycles' number for one tooth, as well as of the fracture mechanics parameters – the critical stress intensity factor and critical crack length. It was established that the fracture of the tooth occurred due to an initial crack existing in its base, which originated during the gear's manufacturing, i.e. due to the so-called "manufacturing-in defect".

Keywords: Bucket-wheel excavator; girth gear; tooth fracture; fracture mechanics parameters;



Substitute bus transport task and definition

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Abstract

The definition of the term of substitute bus transport is anchored in the legislation of each EU Member State differently. This paper is focused on the analysis of the concept of alternative bus transport in terms of legal acts in the Slovak Republic. A substitute bus service is in practice a public bus service that is operated instead of a temporary interrupted rail service. On each bus, “substitute bus service” must be labelled along with the name of the operator. Buses are always waiting at a station building, but if it is not appropriate to approach a railway stop, the buses stop at a place predetermined on the carrier's notice boards announcing the introduction of the substitute transport.

The concept of alternative bus transport is governed by the different legislation of each EU Member State in different widths. The deficiencies in the precise definition of substitute bus transport make it possible for rail operators to provide bus services even in those cases where rail transport is not interrupted. Based on an analysis of the legal regulation of the substitution bus service, this term will be redefined.

Keywords: rail transport, traffic closure, substitute transport, railway act



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Criteria for the Quality of Services of Public Interest Organized by Train Operators

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Abstract

Public passenger transport, namely, a conclusion of a public service obligation contract (PSO contract) requires a unified calculation methodology. If the unified methodology would be made available to all transport undertakings and if calculations and calculation criteria would be unified, a possibility of creating a transport offer would be more available, hence unified. Thus, the primary aim would be achieved, that is, improving mobility of citizens. It is particularly necessary to classify the route and to determine optimal costs, which entail route length, transport volume, and local circumstances. Market liberalization is crucial in terms of speeding up the procedure regarding the conclusion of the public service obligation contract. Rail transport has numerous advantages in comparison with other transport modes and deserves as such a unified model with criteria, which define it. With selected data, it is possible to create a database, which will facilitate a distribution of funds within a single state. Regulation (EC) No 1370/2007 determines the main principles, allocation and contract creation rules. It, however, does not determine parameters of the contract itself. Parameters, which entail the cost of PSO service as well include employees, type of vehicle, track alignment, expenditure, vehicle depreciation, etc. Furthermore, it is necessary to define parameters of transport service itself, which apart from the European standard EN 13816, are to cover accuracy, frequency, cleanliness, proper functioning of technical facilities for vehicles, passenger information, on-board services and handling customers' complaints. Accordingly, urban public transport service is to be defined yet. Urban public transport service primarily should be acceptable to the customer, whether affected by local government or transport operator. For that service, it is indisputably necessary to include quality criteria, which do not deviate from those laid down by the PSO contract, since this concerns the subsidization of transport from other sources other than the state as well. Along with the EU laws, directives and guidelines, it is necessary to define more efficient criteria, by means thereof it would be possible to not only measure but track the level of transport service quality as well.

Keywords: quality of service, PSO Contract, parameters, methodology



Design and research of constructive features of paving slabs for power generation by pedestrians

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Abstract

At the moment, the development of alternative low-power renewable sources of electricity, that do not affect the environment, that is, generating "green" energy, is a relevant scientific and technical task. One of the ways to solve this task is to use various methods and approaches for converting different types of energy into electrical energy. The most relevant and promising are those systems and devices that can run anywhere with easy installation process. Such type of devices partially or fully covers the electricity needs of various objects. The aim of the current research is to study the process of generating electricity by power generating paving slabs - an alternative, renewable source of electricity, depending on the wiring pattern of stepping motors to its electric machine node and on their quantity. Authors use methods for processing experimental studies, methods for the theory of electrical machines and electric drives, as well as methods for calculating electrical circuits for the current research. Authors present a prototype of an energy-generating slab with an electro machine unit that can operate with one or two stepper motors. The results of experimental studies are curves of the dependence of voltage on time. Because of the processing of the obtained experimental data, authors show and describe the graphs of power versus time. Experiments have shown that connecting two stepper motors to an electro machine unit of an energy generating slab makes it possible to increase the value of the generated electricity by about 3.9 times. When pressure is applying to a power-generating slab with a force approximately equal to one average person's step, the device generates approximately 1.16 W of electricity. The amount of generated energy is more dependent not on the weight of the person, but on how quickly the step is performed. The faster the pace of walking and the sharper the steps, the more energy is generated. It is possible to estimate the potential of the power generating paving slabs as an alternative source of energy, taking into account the data obtained from experimental studies and knowing the density of the humans flow.

Keywords: Energy conversion; green energy; renewable sources of electricity; city; transport system; human flow; pedestrians, paving slabs.



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Analysis of nede-structural magnetic method barkhausenov noise for monitoring steel constructions

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Abstract

Steel constructions are subject to many failures during their lifetime. Steel structure failures have a significant impact on their degradation throughout their entire life cycle, so it is important that their condition is regularly monitored. Methods for monitoring steel structures are divided into destructive, semi-destructive and non-destructive. In recent years, non-destructive methods have come to the fore. One of the non-destructive methods is the BN (Barkhausen noise) BN magnetic method, which was used to measure the stress state of a selected steel structure. [1, 2]

Keywords: life cycle; degradation; magnetic method; steel construction



Optimization of railway vehicles circulation in passenger transport

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Abstract

One of the basic principles of railway passenger transport is regularity, which is represented by passenger trains timetable. Regularity of railway passenger transport ensures that railway vehicles circulation indicates exact number of vehicles, which are necessary to fulfill the timetable of passenger trains. Railway vehicles circulation is a sequence of passenger trains, what determines which train is ensured by which vehicle. In the paper, selected mathematical methods, mostly from operational research, are applied to optimization of railway vehicle circulation in passenger transport. Theoretical basis of railway vehicles circulation, which is supported by mathematical application, are used in contemporary conditions of railway infrastructure and railway vehicles. Results of the railway vehicles optimization are costs reduction for the transport company and transport offer improvement for traveling public. The paper includes also a case study of the railway vehicles circulation optimization.

Keywords: railway transport; passenger transportation; railway vehicle; assignment problem



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Estimation of fuel consumption based on data from opening fuel injector valve

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Abstract

In indirect injection, the basic task of the fuel injectors is to prepare the most homogeneous fuel-air mixture at the correct ratio. The electronic engine control regulates the entire engine and changes the amount of injected fuel in respect of the accelerator position and the engine operating state. The vehicle sensors provide a control unit the parameters needed to prepare the fuel mixture (amount of fuel injected). The parameters needed for the estimated fuel consumption were recorded using a performance dynamometer. The recorded parameters, there are the PRM, the time of the injector opening and the amount of fuel injected.

Keywords: injection, PRM, fuel consumption



Is hydrogen the fuel of the future?

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Abstract

Global warming and melting of the ice on both poles of the Earth is caused by the greenhouse effect which is the result of CO₂ production. This gas is considered as the main gas causing the greenhouse effect, although not the only one. To reduce the total amount of CO₂ emitted to the atmosphere, mankind looks for an alternative fuel with no carbon present in its molecules. Hydrogen is such a fuel although emissions are produced also during the fuel production process. To compare hydrogen fuel with fossil fuels, more aspects have to be considered.

Keywords: hydrogen; fuel; emissions; internal combustion engine; fuel cell



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The use of vision systems in the autonomous control of mobile robots equipped with a manipulator

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Abstract

The paper presents examples of solutions that can be used in vision systems designed for mobile robots, which allow to recognize the robot's environment and to plan routes to specific destinations. Implemented algorithm can identify fiducial markers such as ARTag, by means of which the target places or intermediate points can be marked. The mobile robot can create a route on the basis of recognized markers. The paper also shows an example of vision system enabling autonomous operation of the control panel by computing a depth map. The algorithms of the vision system are implemented on the basis of the OpenCV library.

Keywords: mobile robots; vision system; markers; autonomy



Realization of communication via the CAN bus

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Abstract

The paper deals with the communication between the infotainment elements and the drive component of the car using the CAN bus. In the introduction, it is briefly described the communications bus used in cars. It describes its basic features, benefits and utilization. The main task is graphically program and builds a dashboard that will resemble to a real dashboard from a Volkswagen Golf 5. Using the dashboard built in LabVIEW, it controls the real dashboard.

Keywords: communication: CAN bus; LabVIEW; automotive



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Hybrid mode of a two-position controller

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Abstract

The topic of this paper is a two-position control of continuous systems. Such controller may work in several modes such as comparative mode and fixed frequency mode. The main principle remains the same, but the difference lies in the control algorithm. Both modes have their advantages and disadvantages, where comparative mode has better properties in a transient state (e. g. speed), and fixed frequency mode shows better properties in steady state (e.g. precision, quality of regulation process). The paper now presents hybrid mode, which combines advantages of both modes, in order to increase precision, quality of control without losing control speed. This is done by switching from comparative mode to fixed frequency mode at a suitable moment. If the moment is set properly, the overshoot present in the regulation process in comparative mode can be reduced or even eliminated. This paper is focused on a deriving mathematical model of such control, its properties, and simulation.

Keywords: a two-position controller; comparative mode; discontinuous control; fixed frequency mode; hybrid mode;



Start-up power supply for automotive applications

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Abstract

This article deals with the design, simulation and practical realization of LLC converter as start-up power supply for automotive applications with using of new switching semiconductors and supercapacitor. The main topology of the power supply is realized as full-bridge resonant LLC converter in connection with two-phase interleaved PFC converter. The main focus was given to the proper design of the transformer because high power levels are required. Transfer characteristic was modified in the way that required operational characteristics for the proposed application can be achieved. Consequently, the simulation verification of the operation is realized. At the end of the paper, a physical sample of the power supply is shown together with the verification of its operation within given operational regions.

Keywords: LLC resonant converter, synchronous rectifier, interleaved PFC, LTO accumulator, planar transformer, zero voltage switching;



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Analysis of limiting factors of battery assisted trolleybuses

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Abstract

It can be assumed that in the near future the trend of implementation of battery assisted trolleybuses in cities will grow. Battery assisted trolleybus technology combines benefits of classical trolleybus with freedom of standard bus movement. This paper deals with limiting factors of battery assisted trolleybus operation using overhead wires. During the design of minimal trolley network several limiting factors have to be considered. Limiting factors include battery capacity, ambient temperature and much more.

Keywords: battery assisted trolleybus; public transport; state of charge; operation research; traction battery, overhead contact wires.



Towards the Development of a Smart Wearable Device Based on Electrically Conductive Yarns

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Abstract

This paper proposes smart wearable device based on electrically conductive yarns. The proposed platform collects data from two independent accelerators and gyroscopes and sends it via Wi-Fi to a server for processing and storage. All electrical connections between a microcontroller, gyroscopes and others parts of the smart wearable device are created using electrically conductive yarns. These conductive connections are sewn with embroidery machine Barudan BEXT-S1501CII. Different pattern designs and stitches are presented and a functional prototype is shown. The prototype's main computing unit is based on Arduino platform because of its simplicity and ease of implementation.

Keywords: wearable sensors; conductive yarn; gyroscope, embroidery.



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Overview of Battery Models for Sustainable Power and Transport Applications

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Abstract

Battery modeling is an excellent way to predict and optimize some batteries' basic parameters like state of charge, battery lifetime and charge/discharge characteristic. Over the years, many different types of battery models have been developed for different application areas. Individual models differ in complexity, input parameters, available outputs and overall accuracy. This paper categorizes battery models according to various criteria such as approach methods, timescale of modeling or modeling levels. The overview is focused on practical use of individual models and their suitability for different areas of industries, like e-mobility, power engineering or information and communications technology. Finally, the criteria for choosing a suitable battery simulation model for various practical applications are summarized.

Keywords: Batteries; Battery modeling; Electrochemical model; Analytical model; Stochastic model; Equivalent circuit model



Control and stabilization of single-wheeled electric vehicle with BLDC engine

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Abstract

To stabilize a single-wheel vehicle, it is necessary to know the angle of gradient of the platform with respect to the horizontal axis and also the movement of the vehicle. This can be detected in several ways. Accelerometers and gyroscopes are small, accurate and energy-saving today. They provide analog or digital output. In the introduction we will describe the basic parameters of accelerometer and gyroscope. We will also describe the principle of digital signal processing from both sensors. In the next section we look at the effect of dynamic acceleration on the sensors and the elimination of this phenomenon by means of a complementary filter. We explain what is a complementary filter, benefits, and structure. We will include a short code in the C language for data processing.

Keywords: stabilize; accelerometer; gyroscope; complementary filter; DSP



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Overview of batteries State of Charge estimation methods

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Abstract

In the present, electric and hybrid electric vehicles are more and more common. Usually, the main source of energy are batteries. To achieve optimal utilization and protection of batteries, battery management is used. This battery management system prevents batteries from overdischarge and overcharge and provides cell balancing. Accurate state of charge estimation is necessary for these tasks. There are several methods for state of charge determination which can be divided as direct measurement methods, book-keeping methods, adaptive methods and hybrid methods. In this article, commonly used state of charge estimation methods, advantages and disadvantages are described.

Keywords: state of charge, SOC, battery;



Analysis of selected energy storage for electric vehicle on the lithium based

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Abstract

This article deals with the analysis of energy storage tanks in electric vehicles. Paper represents the most used types of accumulators for electric vehicles. Subsequently, the patterns of the Li-ion cell structure are described. Material changes in the internal structure are performed due to better battery output. The result of the comparison is also the development of price the Li-Ion battery.

Keywords: battery cell; electric vehicles; li-ion structure; materials of battery cells;



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The Influences of Electrical Traction on Distribution System

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Abstract

This paper deals with the analysis of power quality influenced by the one of the biggest power consumers in the Slovak Republic – electrical traction. The adversely effects caused by electrical traction affect the distribution grid, from which the electrical traction is fed throughout the whole Slovak Republic and so they decrease the power quality in this grid. This problem is very actual in these days, because customers often use the electrical appliances that are sensitive to the shape of sinusoidal voltage wave. This paper analyses the results of the power quality measured in H-type substation, which is often used to supply the electrical traction. Some of these measured qualitative parameters were compared and evaluated according to the valid standard EN 50 160. The paper also focuses on the problematics of spreading current and voltage harmonics along the traction lines and to the higher voltage level. Therefore, the simulation model of a traction supply section was created in Matlab. At last, passive series LC filter was added to the created model, in order to eliminate harmonics caused by the traction vehicle.

Keywords: electrical traction; adversely effects; power quality; passive series LC filter



Electric vehicle routing problem with single or multiple recharges

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Abstract

Nowadays, due to the new laws and policies related to the greenhouse gas emissions, and the rise of social and ecological awareness of transport sustainability, logistic companies started to incorporate green technologies in their distribution activities. Here, electric vehicles, as a cleaner mode of transport than conventional vehicles come to the fore and many companies are already integrating electric vehicles in their delivery fleets. Compared to the conventional vehicles, electric vehicles have a shorter driving range due to the limited battery capacity, and they need to recharge at charging stations more frequently. To efficiently manage the fleet of electric vehicles, new algorithms that take into account visits to charging stations have to be developed. In this paper, we observed the Electric Vehicle Routing Problem with Time Windows (E-VRPTW) and multiple or single recharge policies during the route. The homogeneous fleet of battery electric vehicles with limited load and battery capacity, customer time windows and full linear recharge at charging stations are considered. The objective is to minimize total traveled distance while operating a minimal number of vehicles. To find the solution of the problem, on larger instances we applied the metaheuristic based on the ruin-recreate principle and on the small instances we solved the mixed integer program with commercial software.

Keywords: electric vehicles; vehicle routing; single recharge; multiple recharges; ruin-recreate metaheuristic



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Design of an electronic odometer for DC motors

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Abstract

The paper proposes an innovative electronic sensor for odometry in mobile robotics. The sensor is based on measurement of current peaks caused by commutation of a DC electric motor. The signal is preprocessed by analog filters, then digital processing in microcontroller is applied. The sensor utilizes small low-power MCU AtTiny44 and provides SPI interface for the communication with the master robot controller. The main advantage of the proposed sensor is the lack of any mechanical parts, which results in high durability. The sensor has been simulated in Simulink and then a fully-functional sample was created and tested.

Keywords: odometry; sensorless odometer; DC motor; commutator



Dynamic model of High Speed Switched Reluctance Motor for automotive applications

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Abstract

In this paper, dynamic model of the already designed a 3 phase, high speed, Switched Reluctance Motor (SRM) is presented. This high speed SRM was designed for automotive applications. The paper begins with state of the art from the point of view of electrical machines high-speed utilization and a description of the switched reluctance motor. Simulation model of SRM is described and used for dynamic simulation. The switching angles in the simulation models are set to achieve the maximum average torque. This analysis is performed for different rotational speed. The results of the dynamic simulation are following waveforms: average torque, torque ripple, losses and efficiency as a function of rotational speed.

Keywords: high speed, switched reluctance motor, dynamic model;



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Power losses analysis in MOSFET 3-phase high current power inverter for automotive application area

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Abstract

This paper deals with analyzing losses of three-phase high current and low voltage inverter, which is intended for automotive applications. High current inverters are becoming more popular in automotive area due to increasing the number of high power electrical drives in cars and trucks. The less reliable and less efficient, usually mechanical drive systems are replaced for more effective and more reliable electrical drive systems. There are liquid pumps, HVAC blowers, turbochargers, etc. Total losses of the common inverters are divided into three main parts, conductive and joule losses, switching losses and additional losses. The highest part of losses usually generates power switches, in this case MOSFETs. The size of other part of losses is determined by parameters of used components, i.e. DC-link capacitors, shunt resistor sensors, etc. The power losses and efficiency of inverter are analyzed by using the simulation model in LTspice. The model of inverter contains spice models of MOSFETs and DC-link capacitors. The parasitic components of high current and excitation traces are also included into model. The analyzed inverter contains only DC-link shunt resistor for current sensing purpose in order to minimize joule losses of shunt resistors. Joule losses of shunt resistor, DC-link capacitor losses, reverse polarity battery protection MOSFET and three-phase half-bridge inverter are analyzed from power losses and efficiency point of view. The final result of this paper describes the size of losses of power circuit and the value of efficiency of inverter, which the high current inverter is able to reach.

Keywords: efficiency, MOSFET, automotive, high current inverter, losses



Eddy Current Array Inspection of Zlin 142 Fuselage Riveted Joints

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Abstract

Aircraft fuselage is subject under the influence of many negative factors during its operation. Non-destructive testing methods are primarily used to minimize the possibility of possible failure. For early detection of any anomalies that may occur at aircraft fuselage are used mainly electromagnetic non-destructive testing and evaluation methods. This paper deals with inspection of riveted joints of the fuselage and wings of aircraft Zlin 142. The aircraft manufacturer determines the prescribed time intervals for the inspection of the fuselage. During the inspection, we will try to detect possible cracks and reveal a presence of hidden corrosion. A suitable method for the inspection of these riveted joints is eddy current testing method (ECT). Eddy current testing is one of the widely utilized electromagnetic NDE methods. It works based on an interaction of time-varying electromagnetic field with a conductive structure according to the Faraday's electromagnetic induction law. This electromagnetic method is suitable for reliable detection of surface and subsurface defects of the riveted joints. Experiments will utilize Olympus OmniScan MX device with presence of ECA module. Eddy current array probes SAB-067-005-032 and SBB-051-150-032 are used, respectively. Harmonic eddy current excitation is used for this purpose.

Keywords: Eddy Current Array Inspection, Nondestructive testing and evaluation, Riveted Joints



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Boeing 787-9 in-flight exhaust emission analysis for the selected flight

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Abstract

Measurements of emissions of harmful compounds in the exhaust gas of jet engines are carried out using stationary engine tests. These tests only determine the emission of harmful compounds in the near-airport operations. This creates the need to develop methods and tools that would allow to estimate the emission values of harmful compounds during all operations carried out by the aircraft, including when flying at a given flight level. In order to develop such a method, data from the on-board flight data recorder were associated with the emission factors determined during the LTO test, which is the basic certification test of aircraft engines. The following article presents the methodology necessary to estimate the real emission of harmful compounds during the flight of a Boeing 787-9 Dreamliner, equipped with Rolls-Royce Trent 1000-G engines.

Keywords: emission, aircraft, turbofan engine, flight;



The impact of the full power characteristics of the internal combustion engine and the traction characteristics of the vehicle on its safety in urban traffic

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Abstract

The aim of the publication was to present the effect of the full power characteristics of the internal combustion engine and the traction characteristics of the vehicle on its safety when moving in urban traffic. The movement of the vehicle in the city was characterized, the condition of its movement was presented and the indicators determining the active safety of the moving vehicle were determined. The characteristics of the full power of internal combustion engines with spark ignition and the vehicle traction diagram were analyzed and compared. Then, on the basis of the performed analyzes, the conditions have been defined which must be met in order to be able to recognize that the vehicle is moving safely.

Keywords: urban agglomeration; safety; vehicle; internal combustion engine;



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Video recordings for the evaluation of braking tests with load

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Abstract

This article describes how to use video recordings in combination with accelerometer data to evaluate load movements in braking tests with a load on a semi-trailer. In the next part the load movement analysis is described by recording device and the two methods are then compared and evaluated.

Keywords: braking test; accelerometer; comparison; video recordings



The possibilities of using longer and heavier vehicle combinations in Slovakia

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Abstract

Maximum allowed dimensions and masses of vehicles are not strictly uniform in European Union. Each country could modify these values. The paper deals with selected longer and heavier vehicle combinations which are currently known as a European modular system. These vehicle combinations bring new possibilities how to make road freight transport more effective. This paper analyses several impact which are associated with longer and heavier vehicle combinations.

Keywords: vehicle combinations; abnormal transport; European modular system



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Selected Problems of Night - Time Distribution of Goods within City Logistics

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Abstract

Night – time distribution of goods is one of the alternatives, which is currently being explored in several EU countries and in several cities. Some projects of city logistics in night hours were solved within an international project. This article will be mainly focused on noise problems connected with night – time distribution and observing the maximum noise limits in urban areas, which are supplied in night – time. The article will also include outputs from noise measurement during day and night supply in the selected retail chain.

Keywords: city logistics; night-time distributions, noise problems



The Possibility of Utilising Maximum Capacity of the Double-Track Railway By Using Innovative Traffic Organisation

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Abstract

This paper will analyse the existing capacity of the double-track railway line M104 Novska – Vinkovci – Tovarnik – State Border – (Sid), located along the RH1 national corridor in Croatia. Upon the analysis, the paper proposes a new and innovative way of organising railway traffic on the line, which is a reflection of the maximum capacity utilisation regardless of the train transport route. Before using the proposed organisation, the track must be fitted with the modern signal and safety system which ensures traffic along the single track of the double-track railway line in both directions. Furthermore, the paper puts forward the methodology and impact of certain proposed criteria on the new organisation method. A simulation of the proposed organisation, using OpenTrack software, examines the results in terms of justification for using such a concept. The M104 railway serves as a case study for testing the innovation in railway traffic organisation.

Keywords: railway track capacity, innovative traffic management, dynamic traffic management, simulation method, OpenTrack



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Optimizing PID controller gains to model the performance of a quadcopter

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Abstract

This article deals with the quadcopter dynamics modelled by tuning the PID controller gains. The model was derived using Newton's equations of motion. Wolfram Mathematica was employed to run simulations and compare different optimization methods for PID tuning.

Keywords: Quadcopter, PID controller, simulation, optimization method;



Liquefied petroleum gas as an alternative fuel

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Abstract

Liquefied petroleum gas, known as LPG, is used as an alternative fuel for vehicles with a combustion engine. LPG is a mixture of propane, butane and other substances of a small amount and it is obtained as a by-product of being manufactured during the refining of petroleum. The purpose of this article lies in the assessment of LPG as an alternative fuel. The article includes the classification of LPG from the economic and safety point of view. It also assesses liquefied petroleum gas as an alternative fuel in terms of emission production.

Keywords: alternative fuel; emissions; excise duty; fuel consumption; LPG;



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The evaluation of exhaust emission in RDE tests including dynamic driving conditions

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Abstract

The article presents and discusses the research results on the impact of RDE test dynamic parameters on the emission of selected exhaust components. The measurements were carried out in compliance with the latest legislative procedures applicable to passenger cars. Two passenger cars with similar curb weight, equipped with gasoline engine, were selected for the tests in real traffic conditions. All tests were performed on the same research route, which includes urban, rural and motorway conditions. The obtained results were analyzed of RDE procedure's requirements and the Euro 6c toxicity standard. Then the values of dynamic parameters of both tests were compared (the vehicle velocity and acceleration product, relative positive acceleration and 95th percentile of $V \cdot a_x$). Their effect on the obtained emission results was determined. As a summary, the correlations between the on-road exhaust emission and dynamic parameters were defined.

Keywords: RDE, exhaust emission tests, passenger cars;



Comparison of the order picking processes duration based on data obtained from the use of pseudorandom number generator

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Abstract

In this paper a simulation model of a part of logistics facility, i.e. an order picking area in a high-bay warehouse, is considered. The construction of this model was preceded by the development of a conceptual model as a result of the study for selected warehouses of this type. The researched simulation model is not a reflection of a logistics facility functioning in reality. This facility is a hypothetical warehouse. The simulation model includes generators of pseudorandom numbers, which, among other things, serve to obtain and introduce randomly generated picking orders (picking lists) into the model. And at the same time these generators reflect and provide the real, often unforeseen, size of orders. This allows, among other things, to analyze the capacity of the considered facility. The paper presents a comparison of results obtained with use of simulation model for pseudorandom number generator with different data at the input to these model.

Keywords: order picking process; picking list; high-bay warehouse; pseudorandom number generator; PRNG



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Unmanned aerial vehicle technology in the process of early fire localization of buildings

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Abstract

The paper is focused on the application of Unmanned Aerial Vehicles (UAVs) in the process of accurate and early source of fire localization during the firefighting operation inside buildings. UAVs in practice allow to use perspectives and insights that are not accessible to ground forces. The authors expect to provide an early localization of hidden center of enclosure fire using UAVs and compare how early detection of fire source could affect overall firefighting process. As a part of verification of this hypothesis a fire test was carried out in collaboration with fire department. Additionally, to the fire test, authors used numerical fire simulation of various scenarios according to experimental conditions. Results demonstrate the use of UAVs in terms of rescue forces and their overall contribution to safety related to firefighting and fire protection of buildings.

Keywords: UAV; Firefighting; Fire Localization; FDS Fire Simulation; Fire Test



Traffic generation by various types of urban facilities within Slovak Republic

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Abstract

At present there is no methodological instruction in the Slovak Republic for the estimation of the traffic volume generated by the new investment of various urban facilities. The present state of the land use regulation allows to build various types of facilities within the urban environment. These facilities many times don't reflect to the potential generation of traffic. They meet only the official requirements and conditions. In this paper, there are presented various data that represent traffic volume generated by several facilities. The data were collected mainly through the traffic studies. The main objective is to show the relation between the generation of traffic volume by several types of urban facilities within Slovak Republic.

Keywords: traffic generation, modelling, urban



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Rationalization of the passenger transport system as an important transport system

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Abstract

Extending individual car transport brings lots of positive effects such as comfort and speed of travel, but also a number of negative aspects such as congested urban agglomerations, a significant increase in air pollutants, higher noise and so on. This problem can only be resolved by a functional passenger transport system with well-functioning public passenger transport as a full-fledged alternative to individual transport, which will meet the needs for the widest possible population.

This contribution defines and analyses the current passenger transport system, including the structure of particular subsystems, a description of the passenger transport chain and travel motives. Subsequently, a set of measures and standards are proposed for improving this system as well as for the general traffic service of the territory. It will also be necessary to rationalize the timetables of particular passenger transport subsystems in the proposal, primarily rail passenger transport as a main transport system.

Keywords: passenger transport, rationalization; transport chain; timetable



Indicator Availability of Postal Services Determined Through Gravity Methods

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Abstract

Selected assessed features of the postal network is focused primarily on the most important aspect that is a customer and on meeting his requirements. Customer requirements focus on service quality areas in particular. The availability of a postal service to a user is generally one of its most important quality characteristics. The availability of individual network devices provides an indicator as a particular object available for other locations in the analysed area. This article refers to the mathematical calculation of availability indicator by using gravity methods. The availability of postal services is shown in the defined territory by isochrone map. In this way, it is possible to determine the availability of postal services in a particular area, which is advantageous for the postal service provider with a view to improving the service, especially for those users to whom postal services are not available.

Keywords: availability of postal services, indicator availability, gravity methods



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Classification of Travel Modes Using Streaming GNSS Data

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Abstract

Over the last decade, smartphones became a valuable source of traffic data. GNSS data and other data from smartphone sensors can be successfully used in travel mode classification. Travel mode classification data are a significant source of information for various applications such as travel planning, urban road operations or user behavior understanding. Today, the availability of access to real-time data streams makes fast and real-time classification of travel modes possible. Because of different characteristics of data streams, the applied classification method has to be adjusted to the particular data stream. In this paper two classification methods, k Nearest Neighbors and Random Forest, are compared with emphasis on accuracy. First, they are applied for classification of travel modes using a static GNSS dataset, and afterward using streaming GNSS data. For the purpose of classification, characteristic distribution of velocity and acceleration for different travel modes is determined. Regarding streaming GNSS data, the influence of the window size on the classification accuracy is analyzed. Obtained results show that both classification methods can be successfully applied for the classification of travel modes.

Keywords: GNSS data; data stream; travel mode; classification; Random Forest; k Nearest Neighbors



Analysis in modal split

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Abstract

The paper deals with the parameterization of the calculation of the modal split in the four-step model determining the traffic prognosis. Multiple Logit model theory is the process of calculating the modal split, the model is in common use for transport modelling. Its advantage is that we can choose from more independent variables. The estimation of Logit function parameters is based on transport and sociological survey in Zilina region. The Biogeme program will be used for the calculation.

The primary task is to create a set of Logit function performance parameters for Zilina region conditions. The choice of a specific transport mode of transport is expressed by the utility function. The function is used in a disaggregated model for individual groups of the population. Groups are characterized by their behaviour in the transport process. The disaggregated model involves simulating the behaviour of individuals in time, space, and their subsequent aggregation into the resulting transport relations of the territory. The modal split will be taken into account in the trip distribution by transport modes: car - driver, car - passenger, public transport, cycling and pedestrian transport.

Keywords: transportation planning, traffic model, biogeme, four-step model , modal split



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The geometry of grooving tool and its influence on dynamic load system for turning

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Abstract

The article deals with the determination of influence of cutting geometry of grooving tool on intensity and course of dynamic load for longitudinal turning of carbon steel C45 (W. Nr. 1.0503). The exchangeable cutting inserts made from sintered carbide and marked LCMF 032504 with different cutting geometry were used for experimental machining. Machining process was carried out under pre-determined cutting conditions with overhang of tools $T_{MAX} = 12$ mm, and 25 mm. The intensity of dynamic load was determined on the basis of the measurement of individual cutting force components with the use of three-component piezoelectric dynamometer KISTLER 9129AA. The resulting burdensome force was counted from measured values of cutting force components, and the influence of overhang of tools on course and stability of cutting process was determined.

Keywords: cutting force; machining; cutting geometry; chip breaker; grooving;



Examining the impact of the deployment of low emission zones in Europe on the technological readiness of road freight transport

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Abstract

The paper deals with the influence of introducing low-emission zones in Europe for technological readiness of road freight transport in the European area. There are efforts on the part of several cities in Europe to introduce regulatory measures for transport, in particular regarding the reduction of exhaust emissions and noise emissions. The current commercial vehicle market offers some solutions reflecting regulatory measures for cities to contribute to meeting global targets to reduce emissions from transport. In the Central European space, however, fleets of carriers operating distribution services are often unprepared for the introduction of regulatory measures in the sense of sustainable mobility requirements. The paper will be published research outputs or vehicle composition currently used in urban logistics supply and city centers is ready for regulatory action.

Keywords: City logistic, low-emission zone, regulations of road transport ;



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Comparison of query performance in relational a non-relational databases for train connections

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Abstract

Data are the most important treasure of the company. They form the source for the analysis, evaluation and decision making. Complex data management requires sophisticated storage structures and access principles. This paper deals with the database storage architectures, principles and differences, describes the main manipulation operations– insert, update, delete and select. For the evaluation, relational databases, such as Oracle, MySQL, and MsSql has been selected, which is consecutively compared in the performance section to the non-relational oriented databases – Mongo, Redis, GraphQL and Cassandra, as well. After the theoretical background definition, the experiment section is proposed. For this purpose, a database of the train connections as a combination of all the train stops in Slovakia is designed. For the first performance evaluation model, the only small data portion is used examining the speed of the operation and loading operation into the table. The second model is far more complex, stores a huge number of records. It evaluates the time aspect, as well as storage size demands. Results are summarized in conclusion showing recommendations for the individual database type with emphasis on the speed of the system and limitations.

Keywords: Sql; NoSql; Transformation; Train connection



Modelling effects of the distributed generation supporting e-mobility on the operation of the distribution power network

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Abstract

The essential idea to support an e-mobility from available electricity point of view is to use distributed generation to produce free electricity to charge e-vehicles. The bigger number of these vehicles, the bigger need for electricity made by distributed generation. The problem is that the distribution power network was not designed to deal with such an issue. As a result, what is undergoing the transformation from a centralized electricity distribution to a decentralized one. If a management of power distribution network is not adjusted properly, it can lead to disturbances in power quality issued guaranteed to customers. Therefore, it is necessary to analyse the influence of distributed generation on the power system operation and look for correct technical solutions. The paper describes the use of a GridLab-D simulation software for analysing the impact of distributed generation on the operation of a typical 22 kV power distribution network.

Keywords: E-mobilita; GridLab-D; 34 Node Test Feeder; distribution network; distributed generation;



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Simulation model of logistic chain in GS1 Slovakia laboratory

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Abstract

Automatic identification combines a number of benefits including time saving, process acceleration, inventory visibility, offering value added services for customers and it is a step towards globalisation. Automatic identification systems can be used in all stages of logistic chain. When the product is identified by the identifier after its manufacture, it is identifiable in each subsequent step where additional information can be assigned to it, which are available to anyone, who reads the identifier, using electronic data exchange systems. Thanks to these advantages, the interest in AIDC technologies grows. GS1 Slovakia Laboratory of Automatic identification is dedicated to those technologies in which they are presented together with relevant standards. For presentation purposes, a software development requirement has been created to make it easy and comprehensible to present AIDC technology. The requirements on software were to capture the logistics chain process from the entry and identification of the goods until the creation of transport unit, presenting the capabilities of the used automation devices in conjunction with the GS1 standards. The article describes the development of this software, a description of the devices on which it is used, and its final design

Keywords: GS1 Slovakia, GS1 standards, logistic chain, AIDC;



Definition of pavement performance models as a result of experimental measurements

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Abstract

Pavement serviceability is one of the main indicators signaling the safe and fluid traffic of vehicles. Within the Pavement Management System, the pavement serviceability expresses by the instantaneous values of the variable parameters. These parameters are constantly changing depending on climatic conditions and a traffic load of the road. Changes in roughness and unevenness can be derived from experimental stretches or from existing communications. At the University of Zilina, APT - Accelerated Pavement Testing was developed to simulate changes in these parameters. The degradation models thus created can be applied in programs that allow economic and technological evaluation of selected sections of the road.

Keywords: Pavement Management System, Pavement serviceability, roughness, transversal unevenness, degradation model



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Simulation study of dynamic heating process of molybdenum for sheet suited for rigid transport components design

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Abstract

This paper deals with the development of the simulation model of the moving molybdenum sheet, while the molybdenum sheet is heated by direct resistive heating. COMSOL/MATLAB environments are used to create mentioned model. Static model created in COMSOL is compared with measurement and based on this comparison the dynamic model (COMSOL/MATLAB) is adjusted. The dynamic model is created as in-loop simulation for different initial conditions of heating elements position and temperature distribution within molybdenum sheet. The result of dynamic model is temperature distribution within molybdenum sheet for given heating elements shift and speed. For that reason, the proposed model can be used for optimization of direct resistive heating system of molybdenum sheet.

Keywords: molybdenum sheet; direct resistive heating; finite element method.



Simulation study of inductive heating of molybdenum sheet suited for rapid prototypes of rigid components of transport systems

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Abstract

This paper deals with the development of the simulation model of the inductive heating of molybdenum sheet. The proposed model is created in COMSOL environment. The main purpose of proposed model is to determine the optimal shape of magnetic element (ferrite) of inductive heating system, through which the electromagnetic field is enclosed trough molybdenum sheet. Next part of this publication is dedicated to acquisition of thermal-frequency characteristic for given shape of magnetic element of heating system. The result of proposed model can be used for optimization of heating element shape as well as for optimization of control algorithm of inductive heating system based on acquired frequency characteristic.

Keywords: molybdenum sheet; inductive heating; magnetic field shaping finite element method.



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Design of a wireless communication based on low power RF transceivers

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Abstract

In this paper, we present the design of bidirectional wireless communication, based on low power RF transceivers. For this purpose, two communication modules were created. The paper describes the selected modulation and flowchart of the communication between modules.

Our proposed solution can be used in Tire Pressure Monitoring systems or in similar application in transport when wireless communication is needed. We are using this wireless communication to drive Small PCB Milling Machine.

Keywords: wireless, communication, RF module, ultra-low power, microcontroller



Detection of static objects in an image using texture analysis

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Abstract

The article deals with the design of a method for the automatic detection of static objects in the image captured by an optical microscope. The search algorithm for static objects in the image - non-moving cilia is based on texture description methods. The texture of the image is described by statistical values, where it can be noticed that background texture, cells and cilia have different mathematical statistical parameters. Just based on the different statistical parameters of the textures, the classification for each texture parameter was done separately. As a result, the resulting classification takes into account the most predominant group to which the pixel has been assigned. The output from the algorithm is a mask, where the original image is overlaid by the obtained mask and cilia area is contoured.

Keywords: image segmentation; texture; cilia; classification;



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Simple method of photovoltaic panel power characteristic measurement based on Arduino hardware platform

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Abstract

This paper deals with simple measurement method for low power photovoltaic panel power characteristic measurement. Proposed method is based on the characteroscope principle, which utilizes simple controlled current sink and measurement circuitry for current and voltage measurements ranging from no load to short circuit conditions on the photovoltaic cell. Emphasis was placed to design the simplest possible hardware based on Arduino platform. The maximum power point of measured panel is obtained by mathematical calculation which is carried out by the firmware of Arduino Central Processing Unit (CPU). Simulation of proposed hardware design and experimental results taken on prototype was shown.

Keywords: Arduino, photovoltaic panel, power characteristic, maximum power point



The Parametric Simulation of the Interleaved Boost Converter for the Electric Transport Vehicle

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Abstract

This paper deals with the analysis of four phase boost interleaved DC-DC converter with the non-coupled inductors for higher power application in Continuous Conduction Mode. The interleaved topology reduces input and output current ripple, voltage ripple and improves the efficiency of SMPS. The value of capacities and inductances affect the behavior of the converter. The investigation of these parameters is described and supported by parametric simulation in LT spice.

Keywords: Continuous Conduction Mode, Interleaved boost converter, non-coupled inductors, simulation;



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Properties measurement of the thin film solar panels under adverse weather conditions

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Abstract

This work deals with the comparison of technologies of modern solar panels for home applications. The article is mainly focused on amorphous and thin film CIGS solar panels, but monocrystalline and polycrystalline solar panels are also mentioned. The article compares the technologies of selected types of photovoltaic panels and compares their advantages and disadvantages. The thesis also provides a description of a measurement device for measuring power of solar panel and light intensity using the LabVIEW programming environment. The work compares the amount of electric power produced per square meter in the case of adverse weather conditions. All measurements are performed with cloudy sky and occasional snowfall.

Keywords: solar panel; monocrystalline; polycrystalline; thin film; photovoltaic power plant



Design of a Filter Compensation Device for Traction Systems Support

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Abstract

This paper discusses about a possibilities of compensation devices for traction support stations for Slovak Railways in the Slovak Republic. The first part of the paper describes power factor compensation and harmonic filtration. In particular, it deals with the possibility filtering 3rd and 5th harmonic. Next part showing a design of the compensation device based on the actual state of the power supply of the Slovak Republic Railway transformer stations. This proposal consists of a compensation device for the Cerveny Kut tunnel. This design contains a separate part, which is focused on harmonic filtering in particular 3rd and 5th harmonic and a separate part, which deals with the compensation of power factor. Subsequently, these proposals are merged for design a filter-compensating device for the support traction systems. The last part consists of the design of simple software, which allow calculating the individual parameters of the filter compensation device.

Keywords: power quality; power factor; filter compensation device; harmonic;



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Evaluating Low Speed Limit of Back-EMF Observer for Permanent Magnet Synchronous Motor

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Abstract

The Back-EMF (BEMF) observer represents a solution for sensorless control of Permanent Magnet Synchronous Motor (PMSM) for middle to high speed range. It is a very robust sensorless method for given speed range and it is often used not only in automotive industry but in overall transport systems. For zero and low speed, an open loop approach (known as scalar control) is often used in low-end applications. However, this method is much less efficient because the position of the stator flux is not known, thus the torque angle cannot be controlled. This yields to lower torque produced for given stator current. Therefore, the aim is to control the motor in closed loop from as low speed as possible. This article will focus on low speed limit of BEMF Observer and will offer approaches how to lower this limit. The observer limits were evaluated under several conditions. The low speed limit of original structure of observer was used as a benchmark to evaluate performance of proposed enhancements and settings. The effect of tracking observer bandwidth will be presented as well as the bandwidth of speed loop. Moreover, real measured voltages were fed into the BEMF Observer instead of demanded values to see if the low speed performance can be improved.

Keywords: PMSM; sensorless; BEMF Observer;



Collaborative assembly task realization using selected type of a human-robot interaction

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Abstract

This article discusses the issue of collaborative robots and possibilities of human-robot collaboration in a collaborative workspace. The main part of the article deals with types of human-robot interaction. This article describes three possible types of the interaction. Through the model example, this article focuses on the collaborative assembly of the pneumatic cylinder using mediated interaction. The information exchange during the assembly is realized by two control buttons located on the gripper.

Keywords: Human-robot collaboration, Human-robot interaction, Industrial robot, Assembly



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Research on parameters optimization for the Additive Manufacturing process

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Abstract

Additive technologies play a significant role in research institutions as well as in the manufacturing sphere. It is also commonly used in the field of transport for preparation of prototype models of final use parts. The own additive manufacturing devices are very easy to operate. However, sufficient experience is needed to achieve the desired result. The operator have to know the basic knowledge and relations.

Presented paper deals with operational parameters which influence the production process in additive manufacturing and quality of produced components by Fused Deposition Modeling (FDM) technology. There are many of parameters which influence the final quality of produced parts, but also own production process. Paper describe the whole experimental evaluation of input parameters for digital model pre-processing with regards to examining measured strength parameters of produces parts, including the quality parameters, as roughness and accuracy. Measured values are statistically evaluated.

Keywords: Additive Manufacturing, Rapid Prototyping, model accuracy, model roughness, strength, Fused Deposition Modeling,



Acoustic cooling ceilings with introduction of stabilized air supply

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Abstract

The article is focused to description of design and the principle of cooling acoustic ceilings. Acoustic ceilings are used to chill areas, which also demand low noise level. Lower noise level is supplied by using perforation. This perforation also allows introduction of stabilized air supply, and hole ceiling is used as big air diffuser. The main advantage is achievement of solid ceiling, which doesn't need any other diffusers to distribute air. Introducing air supply also conclude to increasing heat/cooling power capacity of cooling panels. The article describes influence of air supply to cooling capacity acoustic ceilings.

Keywords: acoustic cooling ceiling, air inlet, natural convection, stabilized air supply;



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Sources of torque ripple and their influence in BLDC motor drives

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Abstract

In automotive applications brushed DC motor is often used because of its simplicity and low price. It is very quiet motor, easy to control and serves as actuators with an overall short operating time. Brushless DC (BLDC) motors have less wear and probability of failure, higher efficiency, but need a more complex control algorithm than a DC motor drive. So brushless DC motor is most suitable for applications demanding long-term continuous duty like fuel pumps. Brushed DC motor is often used also in seat ventilation and in some HVAC (heating, ventilation, and air conditioning) compressors and blowers where low noise operation is required. There is an effort to replace this brushed DC motor with low-cost BLDC motor. But problem of these low-cost BLDC motors is in produced torque ripple, vibrations and acoustic noise. Therefore, sources of torque ripple and their suppression has to be identified. This article will be focused on identification of main sources of torque ripple caused by construction and control of BLDC motor. Sources such as cogging torque, waveform of Back-EMF in combination with waveform of phase currents (type of control technique), dead-time and commutation of currents will be investigated. Impact of these sources will be identified on real BLDC motor and also torque ripple, vibrations and acoustic noise will be evaluated in this article.

Keywords: BLDC motor; PMSM; torque ripple; noise; cogging torque; Back-EMF; dead-time



Vibration analysis and comparison of the damaged and undamaged rolling ball bearing

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Abstract

This article deals with vibration analysis and the processing of the vibration signal obtained during the experimental measurement on a rotary shaft at start-up, constant speeds and run-out, with a ball bearing roller. The next step of the research is the introduction and application of mathematical and numerical methods for the processing of input and measured data using diagnostic and mathematical software. The principle of measurement and processing was to compare the results of oscillation of an undamaged bearing with several types of damaged bearings with corresponding deformations in the orbits. The purpose of the research and comparison was to achieve optimal results (in terms of amplitude values, the occurrence of eigenvalue vibrations and the resonance phenomenon) of individual bearings with corresponding impulses in the orbits and to obtain calibration diagrams as a tool for possible prediction of bearings in operation.

Keywords: Analysis, Vibrodiagnostic, Mathematical algorithms, Rolling ball bearing



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Identification of tool wear when drilling process of bearings steels C56E2 with microstructure of lamellar pearlite

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Abstract

Application of drilling process is currently rapidly increasing mainly in bearings industry and machining of hardly-to-machine materials. Therefore, the drilling tool is subject to various requirements in terms of quality of making holes, production efficiency and economic indicators. If we want to optimize these aspects of production, it is necessary to analyse tool wear intensity in direct interaction with given machined materials. During cutting process, different cutting wedge deformations occur, leading in most cases to a rapid wear and destruction of the cutting wedge. This article deal with monitoring of exchangeable-tip drill wear intensity during drilling of bearing steel C56E2.

Keywords: drilling, wear; bearing steel, exchangeable-tip drill, machinability;



Study of technological parameters of steel Domex when high speed machining by monolithic ceramic milling tool

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Abstract

Experiment includes the study and identification of monolithic ceramic mining tools by machining the Domex 700 steel that belongs to the group of tough metals with high tensile strength. During the process of machining, the substandard high cutting speeds were used. Identification of ceramic mining tools included the analysis of cutting edge wear and the construction of map of surface roughness parameter Rz dependence on the change of cutting conditions for a given range (machine and material).

Keywords: monolithic ceramic milling machine, high-speed machining, surface roughness parameters, cutting edge wear;



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Measurement of Small Complex Shapes

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Abstract

The submitted article is dedicated to the detail comparison of measuring result of geometry optical element on light guide for car's day light. Inspection and evaluation were performed on various measuring devices that use a different measurement principle. This article also describes how the individual segments were prepared for measurement and the measurement itself. The obtained data are evaluated both from a technical point of view, where the actual measured values of the optical segments are compared from each measuring device, as well as from an economic point of view, where the time intensity of the overall control of the optical elements is assessed. Based on the data obtained, it has been found that the Atos Core optical scanner is best suited for measuring individual optical segments.

Keywords: Measuring; Optical Segment; Light Guide; Optical Scanner; Coordinate Measuring Machine; Microscope



Identification of roughness parameter when turning process with helical cutting edge for machining of automotive transmission parts

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Abstract

This article describes process of identifying of the value of roughness parameters from basic kinematic and geometric characteristics of turning process with tool with helical cutting edge. The final mathematical formula is deduced from graphic sketch of turning process and consequently identified using all the known geometric and kinematic parameters. This formula can be used to theoretic evaluation of geometric and cutting parameters influence on the quality of machined surface determined by roughness characteristic of theoretic parameters.

Keywords: hard turning, helical cutting edge, theoretical roughness;



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Analysis of surface roughness in turning process using rotating tool with chip breaker for specific shapes of automotive transmission shafts

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Abstract

Increasing machining productivity is the cause of constantly looking for new machining methods and methods to ensure the required quality. One of these methods is machining with rotary tool, which combines conventional cutting materials with an unconventional machining scheme. These properties allow to improve cutting conditions and thus increase productivity with preserved quality. In this paper, there is made the identification of properties and possibilities of using the rotating tool during turning. The main focus is the analysis and evaluation of technological parameters and surface quality, especially surface roughness.

Keywords: rotary tool, machining, turning, surface roughness



Analysis of residual stress in the production of automotive prototype tools by multi-axis technology

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Abstract

Surface quality influences characteristics such as fatigue strength, wear rate, corrosion resistance, etc. Steel components often have to be machined after heat treatment in order to obtain the correct shape as well as the required surface finish. Hard turning allows manufacturers to simplify their processes and still achieve the desired surface finish quality. There are various parameters such as cutting speed, feed rate, and tool nose radius that are known to have a large impact on surface quality. This article describes, how different cutting parameters affect the machined surface and fatigue life in machining. The goal of this work is analysed residual stress if tools production is replaced by grinding on multi-axis machining.

Keywords: multi-axis, residual stress, production, tools



Topic 3 CONSTRUCTION IN TRANSPORT

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Sensitivity of dose-response function for carbon steel under various conditions in Slovakia

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Abstract

Degradation of materials, especially reinforcement in the reinforced concrete members, is very important phenomenon not only in the traffic infrastructure network. Here can raise the question, how high is the corrosivity of atmosphere in various areas in Slovakia and how the variability of climatic parameters affects the corrosion rate r_{corr} . The first annual corrosion rate of carbon steel is possible to calculate according to dose-response function described in the actual standard EN ISO 9223. The dose-response function is relatively complicated formula, which contains mathematical expressions like exponential-function or power-function. So, it is difficult to assume which one of the four input parameters, like temperature T , relative humidity Rh , content of chloride ions Cl or sulphur dioxide SO_2 has higher sensitivity on the corrosion rate calculated from the function. The paper is focused on the sensitivity analysis of dose-response function in the range of input parameters monitored by Slovak hydrometeorological institute and the effect of spraying or splashing transport mechanisms of de-icing salt was observed, as well.

Keywords: Sensitivity analysis, corrosion rate, chloride deposition rate, de-icing salt, reinforcement, concrete



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The flowing of particulate matter through baffles depending on their number in the flue gas tract

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Abstract

At the present is still paid a lot of attention to particulate matter, because these particles have negative effect to environment and also they are harmful to human health. It is a reason why we must reduce their concentration in the atmosphere. They are getting into atmosphere from various mobile, as well as stationary sources including combustion. They can cause everything from minor pain to deadly diseases, for example asthma, premature birth, infant mortality, heart disease, respiratory illness, lung cancer or premature death. We can reduce them during the combustion process by many ways, such as optimizing the flue gases flowing or using separators. This article deals with capturing particulate matter by using baffles placed in the flue gas tract of heat source. It observes flowing of particulate matter through two, three and four baffles by using CFD simulations and then it compares their effect. CFD uses numerical analysis and data structures to solve and analyse problems that involve fluid flows.

Keywords: particulate matter; CFD simulations; emission reduction



Amount of Chlorides in Corrosion Products of Weathering Steel

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Abstract

The article focuses on the study of microclimate conditions under bridge structures and their influence on the characteristics of corrosion products developed on the surface of structures designed from weathering steels. The development of a protective corrosion product layer on weathering steel is influenced mainly by the time of wetness, structural solution of the bridge and concentration of corrosion stimulators in the atmosphere. The main corrosion stimulators in the air are sulfur dioxide and chlorides. Since the 1990s, concentrations of sulfur dioxide in Central Europe have significantly decreased. Currently, chlorides are the main corrosive stimulator, primarily from deicing salts used in winter road maintenance. The extent and scope of corrosion damage to a steel structure located in an environment with high chloride deposition is not uniform across all exposed surfaces. The submitted article therefore focuses on monitoring the dependence between the amount of chlorides deposited and the location and orientation of typical surfaces of steel bridge structures.

Keywords: corrosion; weathering steel; chlorides; corrosion losses; elemental analysis



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New methods of noise reduction in railway carriages

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Abstract

Source of noise and possibilities of noise reduction in railway vehicles. Simulation methods of noise transfer in railway vehicle structure. New possibilities of noise reduction using unconventional design and materials in railway carriages. New methods of noise experiments.

Keywords: railway vehicle; railway carriage; noise; experiment



Operational Modal Analysis of the Laboratory Steel Truss Structure

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Abstract

Modal analysis in operational conditions is popular way for obtaining natural modes of civil structures such as bridges or dams nowadays. This approach called Operational Modal Analysis (OMA) overcomes difficulties with input forces used for excitation of the structure in Experimental Modal Analysis (EMA). In OMA the input forces are assumed to be stochastic. The paper presents the experimental measurement and analysis of the mode shapes and frequencies of the laboratory steel truss structure using output-only method based on Frequency Domain Decomposition (FDD). FDD technique for a decomposition of the spectral density function matrix in combination with a method for merging measured data from multiple measurement set-ups are both implemented into a data processing tool designed in LabVIEW. Modal exciter and random impulses in random points are used for the structure excitation. The results demonstrate the influence of different types of operational loading on identified modes.

Keywords: laboratory steel truss structure, natural modes; Operational Modal Analysis; Frequency Domain Decomposition; multiple measurements set-ups



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Numerical simulation and experimental verification of torsion fatigue tests for material Weldox

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Abstract

The aim of the article is to theoretically determine the stress and strain state in a critical area of the sample, based on its FE numerical simulations. On the basis of a series of simulations, a load plan of a real sample for experiments on fatigue testing equipment was set up. The predicted load levels were calculated, assuming constant strain testing. The result will be the Manson-Coffin fatigue curve. Based on the presented calculations, the stress state in terms of the nominal value will be predicted.

Keywords: fatigue test; numerical simulation; torsion; Weldox



Tensile test for specimen with different size and shape of inner structures created by 3D printing

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Abstract

The paper is focused to size and shape influence analysis of inner structures to mechanical properties of the construction created by 3D printing. Analysis is solving in finite element method software ADINA. Foundation of the analysis is a specimen, where have same dimensions and boundary conditions. Boundary conditions replace tensile test with loading 1000N. Aim of the research is to get results (size and shape of the inner structure) of the specimen by tensile test. In results will be outputs (mechanical properties - stress, strain) compared among each other and used next calculations and optimization. Knowledge of these properties is very important in the production of Onyx-based components for the automotive and aerospace industries.

Keywords: 3D structure, 3D printing, Onyx, FEM, FE analyses



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Comparing mechanical properties of composites structures on Onyx base with different density and shape of fill

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Abstract

Technology for 3D printing allow to create parts with different shapes and directions of inner structures for example: triangles, squares or hexagons. Paper is focused on comparing mechanical properties of composite structure on Onyx base with different density and shape of fill. Specimens were created by 3D printing from composite material Onyx. At creation specimens were used different structures, which allows software of 3D printer Mark Two. Tested specimens are different in density and shape of inside structure. Aim of paper is find mechanical properties of specimens and compare this properties among each other. From results to determine the most advantageous shape and density of inside structure, which can be used in transport industry and in another sectors of industry.

Keywords: Composite, Onyx, Tensile stress, 3D printing



FEM analysis of long-fibre composite structures created by 3D printing

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Abstract

Fiber reinforced composites have significant usage in aircraft and automotive industries due to their advantages like high strength to weight and stiffness to weight ratios. Short manufacturing cycle time and low production cost are reasons of continued development of additive manufacturing. 3D printing allows to produce reinforced composites but there is necessity to improve printing parameters and propose appropriate fiber deposition with aim to gain suitable mechanical properties. Article is focused on assessment of different options of creating long fibre composite models for 3D printing. These models are reinforced using long aramid, carbon and glass fibres. The goal of paper is analyzing of geometry constraints of fiber adding into structure. In addition, the alternative ways of modelling in FEM software ADINA will be presented.

Keywords: additive manufacturing, 3D printing, fiber, geometry constraint



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Testing of Subsoil Support in Physical Model of Piled Embankment

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Abstract

Piled embankment is a type of soil structure that offers convenient technical and cost effective solution for the construction of transport lines in situations when soft soils are present, groundwater is near to surface, or there is an organic unbearable soil profile of significant depth. Other reasons for using pile support for embankment is that total replacement of soft soil is not a cost effective solution or that any other ground improvement techniques are not efficient enough. The article describes continuation of research on pile embankment structure design and its verification by a physical model. Partial support of subsoil and load transfer can be considered in piled embankment structure at some cases of subsoil type. Partial support means that the calculated tensile forces induced in reinforcement on pile heads are lower compared to the case of a very soft subsoil (without subsoil support). After a series of tests of physical models of piled embankments without subsoil support, new models with subsoil support have been prepared. There are many possibilities of simulating soft subsoil, our team decided to use mattress foam which has a non-linear stiffness and this material is convenient for the installation. A foam type was selected to simulate partial soil support for which basic parameters were determined for further research.

Keywords: Piled embankment, geogrid, soft soil, subsoil support



The Slope Stability Solution Using Meshless Local Petrov-Galerkin Method

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Abstract

The paper deals with use of the meshless method for slope stability analysis. There are many formulations of the meshless methods. The article presents the Meshless Local Petrov-Galerkin method (MLPG) – local weak formulation of the equilibrium equations. The main difference between meshless methods and the conventional finite element method (FEM) is that meshless shape functions are constructed using randomly scattered set of points without any relation between points. The shape function construction is the crucial part of the meshless numerical analysis. The numerical example of the slope stability was calculated using meshless computer code and compared with FEM and limit equilibrium (LEM) results.

Keywords: Meshless Local Petrov-Galerkin, Finite element method, analysis of slope stability.



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Determination of priority stream volumes for capacity calculation of minor traffic streams for intersections with bending right-of-way

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Abstract

In Slovakia, unsignalized intersections with bending right-of-way (major street not leading straight, but bending) are a common part of the road network. Their specific mode of right-of-way results in different priority ranks of traffic streams and more complicated traffic situation. The current regulations do not provide procedures to determine the capacity of this kind of intersections. There are needed modifications to determine a priority traffic volume due to a new hierarchy of traffic stream priorities. The priority stream volume, together with driver behavior characteristics, is an important input for calculation of minor stream potential capacity. It is determined for each minor traffic stream individually and presents the sum of the conflicting major stream volumes. However, in some cases also potential conflicting traffic streams, when they share a lane with conflicting traffic streams, are considered because they affect minor-stream drivers. Therefore, for the new calculation proposal of priority stream volumes, the influences of these potentially conflicting streams have to be determined. For this purpose, the traffic surveys at two four-leg intersections with bending right-of-way were done. According to survey results, the potential conflicting major streams and their impact to the minor-stream drivers are determined and the proposal of priority stream volumes is established and presented in this paper.

Keywords: intersection, bending right-of-way, conflicting traffic stream, priority stream volume



Measured and simulated temperature values in the chosen wall of a wooden building considering cardinal direction

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Abstract

The lightweight timber-framed walls were built in a climate chamber at the pavilion type laboratory which is part of the Department of Building Engineering and Urban Planning Faculty of Civil Engineering, University of Zilina. There are different walls, for example with blown thermal insulation, ventilated external facing, massive wooden beams or a sandwich structure. Orientation of these two walls is to the south and to the east. Sensors of temperature and humidity are situated in every wall compositions. Measurements are going on the stationary internal conditions and the real outside conditions in Zilina. Latter internal conditions are going to change into the non-steady thermal state. This article is focused on a comparison of experimental measurements and simulations of the selected sandwich wall. One fragment of the wall is oriented on the south and another on the east. At the end of the research, there will be the analysis of coupled transport of heat and water in sandwich walls of a wooden building. This research could lead to the recommendations for the design of low energy wooden building.

Keywords: sandwich wall; wooden house; temperature simulation



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Analysis of the influence of the selected exterior surface finish on the thermo-technical behaviour of passive wooden constructions

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Abstract

Every year, the increasing requirements for building energy efficiency with increasing thermal resistance of envelope structures oblige designers to use state-of-the-art design solutions. Lightweight external walls with a load-bearing wooden structure supplemented with thermal insulation are amongst the progressive solutions of the envelope structures in the civil engineering. Their low weight and relatively low thickness with adequate thermal resistance are a clear choice to meet current legislation. This work deals with these constructions and analyses their thermal-technical behavior using computer numerical analyzes. It shows the importance of using the ventilated air cavities in terms of preventing the construction from overheating.

Keywords: construction; temperature; relative humidity; simulation



Pipeline in thermal insulation of outside wall

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Abstract

The paper deals with the pipeline management in the thermal insulation of the perimeter wall. Such a pipeline reduces the thickness of the thermal insulation of the building envelope, deteriorates the thermal insulation properties of the wall and creates a linear thermal bridge. The paper deals with alternatives of gas pipeline placement in the thermal insulation of the perimeter wall. The result is a comparison of alternatives of detail solutions with graphical representation of temperature and humidity of structures, description of critical areas and possibilities of application in practice.

Keywords: thermal insulation, gas pipeline,



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Comparison of beam-column resistance according to European Standards

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Abstract

When designing slender steel beam-columns, verification of their resistance have to satisfy design criterions according to approaches given in EN 1993-1-1. Torsten Höglund (2014) also presented proposal for verification of beam-column resistance, which is based on design approach accepted in EN 1999-1-1, together with comparisons between these two standards on simply supported members subjected to compressive force and constant or linearly distributed bending moment. In this paper, further comparisons between these two approaches with different end conditions and different distribution of internal forces are presented.

Keywords: beam-collumns, steel, second-order theory, stability verification



Experimental and theoretical study of composite trusses

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Abstract

The optimal use of the properties of steel and concrete is the advantage of composite constructions made of these materials. Especially, the steel section works efficiently in tension and the concrete part may transfer loads in compression. In composite element, they are acting in common to resist axial forces and bending moments. This structural system behaviour is rather complicate, mainly in the case of steel trusses combined with a concrete deck. Experimental research and numerical simulations based on finite element method are used to analyse the mechanical behaviour of these modern structural members.

Keywords: truss beam, shear contact, numerical modeling



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Numerical comparison of concrete columns strengthened with layer of fiber concrete and reinforced concrete

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Abstract

Concrete structures that are influenced by degradation, overloading, the thawing and freezing cycles, abrasive damage, corrosion of reinforced bars, should be repaired or strengthened. Each of those mentioned influences lead to decreasing the load-carrying capacity of the structure or its member. The damaged structure stops to fulfil the serviceability limit states (SLS) and ultimate limit states (ULS). For this reason, the structure has to be strengthened to increase the load-carrying capacity and elongation of remaining lifetime. One of new method for strengthening vertical members (columns of frame structures) is the using fiber concrete layer and utilization its increased tensile strength in comparison to common concrete.

Keywords: fibre concrete, strengthening, column, numerical



The use of foam glass based aggregates for the production of ultra-lightweight porous concrete for the production of noise barrier wall panels

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Abstract

In the last few years, there is an increasing demand for hygienically harmless environment in the area of well-being. One of many hygiene limits is the reduction of unwanted noise, especially from road or rail traffic. Road and rail traffic poses a huge noise burden, mainly in the built-up areas and civil construction. Unwanted noise needs to be reduced (diverted, swallowed, deterred). The most common tool for noise elimination is construction of various types of noise barriers, embankments, silent road covers and other elements. The paper deals with the development of noise barrier wall panels using lightweight porous concrete with foam glass based aggregate in the absorber area.

Key words: Sound absorption, noise barrier wall panels, absorbent material, lightweight porous concrete



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Analysis of the possibility of the use of tough side bearers in the covered wagons design for the light-weight loads transportation

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Abstract

At the present time in Ukraine and CIS countries the volumes of transportation of utilized and light-weight packaged cargos have increased. Conditions for the transportation of these loads require the formation of a fleet of specialized covered wagons. Their development, production and tests are carried out in order to create and supply this type of wagons to the railways of Ukraine and other CIS countries. At the same time, insufficient purchases financing does not allow the formation of a corresponding fleet of wagons with new designs. Therefore there is a need to replenish the fleet with wagons taking into account the available wagon structures. Specialized covered cars having side bearings with gaps can be used as such structure. There is a need to fully investigate the functioning of the replacement of contact side bearings by side bearings with gaps in order to ensure the necessary level of running qualities of the mentioned cars. The results of such studies are presented in the article.

Keywords: Specialized covered wagon; Steel side bearing with a gap; Running dynamic tests; Dynamic qualities; Derailment stability, Stability against side dump



Proposal of the tram car bogie conception with advanced suspension and steering system

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Abstract

On the city railways, as a result of routine operation, significant track load take place. This is manifested by formation of track geometry deviation, rail heads wear and by the track clearance widening. Therefore the guiding forces in rail-wheel contact are increased and the situation is getting worse. Authors consider this situation firstly as a result of non-suitable bogie conception used by vehicles in operation, it means not as a poor quality of track building. This paper is focused to propose of a new tram car bogie conception, which take in to account specific conditions of the city railways, which for is the bogie intended. Presented bogie conception is characteristic by frame to wheelsets mounting by only three bearing boxes and by presence of mechanism for setting wheelsets to the radial position when passing track curves. This is a new, non-conventional solution, for which a number of patent applications have been filed. In this days, simulation analysis of vehicle ride equipped with proposed bogies are taken. Based on first obtained results, it is assumed multiple life extension of track and vehicle curve-passing resistance minimizing. Also significant reduction of ecological load to the environment caused by this transport system is expected.

Keywords: track-friendly bogie, wheel load deviation, tram bogie concept, wheelset positioning in track curve.



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Estimating the brake disc air resistance by scaled test rig and by computer simulation

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Abstract

One of the typical problems of modern high speed transport is its energy efficiency. Vehicle air resistance makes a major part of them. Usually, attention is put on the vehicle front part geometry and cross-section size. But air flow around rotating parts, especially brake discs, has significant impact on the overall air resistance, too. On one hand, the air flow through brake discs is needed for cooling. On the other hand it causes significant energy losses, when disc cooling is not needed. Research in the field of disc cooling channels can result in minimizing of this air flow resistance. Authors deal with estimating the brake disc resistance by both computer simulation analysis and by experiment on special test rig. In this paper, special test rig and proposed measurement process are described. Obtained results are compared with computer simulations.

Keywords: air resistance; brake disc; rig; brake disc air – pumping torque moment measurement.



Prediction of the rail-wheel contact wear of an innovative bogie by simulation analysis

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Abstract

Rail-wheel contact wear is an actual technical problem, which requires special attention especially on vehicles operated on track with curves. An innovative bogie for tram cars with system for setting radial wheelset position when running along curves was proposed. This paper deals with the prediction of wheel wear by simulation analysis in Simpack software. Obtained results are subsequently processed in a special, by authors created program in order to predict the worn tread geometry. Two cases are compared – wheel wear in case of bogie with working and with blocked mechanism for wheelset position setting.

Keywords: wear, dynamic analysis, contact pair and rail, software SIMPACK.



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Innovative solution for experimental research of phenomena resulting from the wheel and rail rolling

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Abstract

For real operational needs, you need to know what happens when interacting with investigated devices. Therefore, some tests need to be performed under isolated laboratory conditions, where marginal conditions can be modeled more accurately than in operation. The laboratory environment is independent of weather conditions. What is, however, in real operation achieved by the shape of the device (track gauge) and driving conditions (speed, transverse acceleration) is required in laboratory conditions by actuators and force members. As an example, an action member for changing the axial position of the rotating rail can be mentioned. This was done because of the inadequate results due to the wear of the worm gearbox.

Keywords: rail wheel; track gauge; hydraulics; rail transport.



Innovative solution for test equipment for the experimental investigation of friction properties of brake components of brake systems

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Abstract

The article deals with the issue of a test facility for the experimental research of the friction properties of the brake systems of rolling stock. The article presents the individual parts of the UIC flywheel brake test bench and the possibility of measuring the individual quantities according to UIC requirements. The article presents a calculation of the normal and tangential force generated by braking of the brake disc. The main goal is the calibration of the tangential force sensor and the detection of the possible hysteresis of the braking system, the determination of the characteristics and linearity of the tangential force sensor and results measured by flywheel brake test bench must be relevant and usable for further scientific research into the brake systems of rolling stock.

Keywords: brake, flywheel, test bench.



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Detection of residual stress in a railway wheel

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Abstract

With the increasing speed of traffic, care must be taken to ensure the safety and reliability of individual subsystems and parts of rail vehicles. Basic parts include rail wheels. With thermal load of the wheel and during braking tests, residual stress occurs in the wheels. The aim of the paper is to give more insight to the ultrasound method for measuring residual stresses and to detect residual stresses in the railway wheel using the ultrasound measurement method and provide an estimate of residual stresses by means of the thermal-structural analysis in the ANSYS program.

Keywords: rail wheel; stresses; rail transport.



Design of a technical solution for a metro door system

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Abstract

The article deals with one of the most important parts of the metro, which ensures the smooth movement of persons between the metro and the subway station. A proposal for a technical solution for the metro door will be presented using a sliding plug door type system, the main parts of this system and the principles of its operation. The main goal is the creation of a parametric model, defining important parameters and determining the external forces, which act on the mechanism of door guidance and hence on the coarse construction of metro wagons.

Keywords: metro, door system, sliding plug doors.



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Reliability analysis of metro vehicles operating in Poland

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Abstract

Reliability of the metro vehicles is a key factor for providing of regular, safe and undisturbed passenger transport in the urban agglomerations. The research contains failure analyses of the two types of metro vehicles, and comparison of their reliability functions. Data on damages of the metro rail vehicles have been obtained in the form of complaint protocols. Having extracted the damages from the same protocols the next step was to allocate in the established groups. The two subgroups have been created: mechanical and electrical failures.

The results of analysis have shown that the rolling stock of two types is subject to a significant number of damages in the initial phase of exploitation. Among vehicles of the same type there are differences in number of damages of one kind (mechanical or electrical) and considered damage group.

Keywords: reliability, rail vehicles, metro



Research of possibilities of reducing the driving resistance of a railway vehicle by means of the wheel construction improvement

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Abstract

The paper contains results of research of the driving resistance reducing of a railway vehicle by the modification of a railway wheel construction. The perspective railway wheel construction allows the possibility of the relative rotation of the guiding and supporting wheel surface. Based on current research of experts and specialists in the field of the railway transport and taking into account existing requirements and standards several technical solutions of such a wheel are developed. There are also presented results of stress and strain analyses of these technical solutions. Based on obtained data it is possible to conclude that proposed construction solutions meet requirements for the safety factor.

Keywords: rail transport, regression equation, resistance to motion, studies, 3D models.



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Virtual software testing and certification of railway vehicle from the point of view of their dynamics

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Abstract

The paper presents selected tests that must be performed in the process of releasing to service of a rail vehicle. The research has been done in compliance with the requirements of the TSI. 4.2.3.5. and Annex R, UIC 530-2 Annex G in the framework of the simulation studies performed with use of authors' own simulation software created in Matlab Simulink. The research is focused on the procedures and dynamical tests of a freight wagon Eanos series, type 445W designed for use on railway lines with track width of 1435 mm in the conventional rail system. Regardless of the type of entry into service, all relevant subsystems and vehicle systems must be tested. The obtained results showed new possibilities not only in the area of building models of multibody systems but also tests to be carried out in order to assess correctly running gear designs.

Keywords: rail vehicle, multibody system dynamics, the process of release, research of railway vehicles



3D Meshing Methods of Ball-Rolling Bearings

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Abstract

This article deals with the problem of 3D meshing of ball-side parts of bearings. The article consists of 5 thematic units. In the first paragraph, the geometry of a bearing is being analysed with the basics of the simulation and its problems in general. The second part presents a generated 3D model of the bearing with the rolling solid. This rolling solid was divided by 5 different methods for 3D meshing. The third part of this article deals with the subject of 3D modelling of rolling solids in general, using Apex Grizzly programme with the feature of Linear HEX Elements and Tetra Elements, describing the method “2.5D meshing” and conditions for the approach. The fourth part addresses the calculation in MSC Marc Mentant programme. In this part, the calculation method for a model with three contact surfaces is being described. The simulation problems of Ball-rolling bearings and calculation of Hertz contact trough analytic equation is analysed. The last section of this article presents the conclusion of different types of simulations of the rolling-ball bearings. Also, each length of the contact surfaces with each other, as well as the computing Hertz contact values versus simulation were compared. Last but not least, the nod amount of elements influenced by the method of how the rolling solids were divided is compared. In conclusion, there is a suggestion on which meshing method should be preferably used.

Keywords: rolling solid, Tetra Elements, HEX Elements, a computing model



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Application of a Gage R&R study in evaluation of rolling bearing measurement system accuracy

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Abstract

Evaluation of the accuracy of metrological vibration measurement systems located in the factories producing rolling bearings for automotive applications is very difficult, in particular due to the lack of reference bearings and the relatively low repeatability of results caused by the dynamic nature of bearing operation. Nevertheless, there are situations in which there is a need to compare several systems with different designs together, among other things, to find the best technical solutions of these systems or to indicate a reference system. This article presents the application of R&R study to indicate the measuring system of vibrations of rolling bearings characterized by the best parameters of repeatability and reproducibility of results.

Keywords: rolling bearings; measuring systems; accuracy; repeatability; reproducibility



Strength analysis of slewing bearings

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Abstract

The thesis deals with the creation of a 3D model of the slewing bearing and its functional parts on which the axial load acts. In order to investigate the load applied to the bearing as a whole and to examine the effect of forces on the rolling body and the rolling tracks, it was necessary to create a computational 3D model with computational finite element mesh. Model of slewing bearing was designed in the Creo Parametric 3D modeling program. The individual bearing elements have been designed to create a functional mesh on each of them in the work environment of the Ansys Workbench. In order to carry out bearings stress tests and examine their behavior at various parameters such as bearing size, then the parameterization of bearing geometry and the interconnection of the cad program with the calculation program were performed. This has accelerated the process of introducing the model from the Creo model into the Ansys Workbench computing program. Based on many analyzes and results, graphs were constructed and the analytically obtained results were verified by calculations based on Hertz's contact theory.

Keywords: Bearing; Computational; Parametrization;



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Investigation of ride properties of a three-wheeled electric vehicle in terms of driving safety

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Abstract

This article presents process and results of investigation of ride properties of a three-wheeled electric vehicle, which was designed in our workplace. As the key factors of ride properties driving safety and ride comfort for passenger are analysed. Ride comfort for passenger of road vehicles is one of the most important performances of vehicle; the research of automotive passenger ride comfort is getting more and more important. At the same every vehicle has to meet quite strict criteria for driving safety. Process of investigation was carried out using Simpack multibody software package.

Keywords: Three-wheeled vehicle; multibody simulation; ride properties; safety



Front suspension design of the lightweight vehicle

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Abstract

In this paper going to be described process of designing of a front suspension of wheels for electric light weight vehicle. This suspension must be fully adjustable. It means that we need to adjust angle of camber, high of wheelbase. Functional conditions of suspension are cushioning, deceleration and cornering. Geometry of this suspension will be specific because of unconventional car body style. Due to this case, there is a need to design new one.

Keywords: suspension; extended arm suspension; electric light weigh vehicle;



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Autonomous vehicles in urban agglomerations

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Abstract

Autonomous vehicles have been of particular interest in the world for more than half a century. Recently, one can even observe the intensification of research and implementation works on this type of vehicles and transport systems. In the article the authors will refer to the following problems:

Definitions of the different types of autonomy with regard to vehicles and transport systems, Issues of safety and certification of autonomous transport systems and required infrastructure; Expected benefits of this type of vehicles in cities, and specific solutions for people with disabilities

Concepts of various solutions taking into account Polish plans and the original concept of the Polish system "Prometheus".

The paper will outline the proposed Polish technologies, software for calculations in the area of traffic engineering and will show Polish pre-prototypes with constructional details.

Keywords: public transport, autonomous vehicles, Polish solution



Parameterization of the operating conditions of the vessel's turbine engine in the aspect of the pollutant exhaust emission assessment

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Abstract

Pollution emission tests from turbine engines used for the main propulsion of vessels require measurement of the concentration of harmful compounds in the exhaust and assessment of the exhaust gases mass generated by the engine. The concentration of harmful compounds can be determined in a direct way by measuring it in the stream of exhaust gases. However, due to the large output of exhaust gases, the mass of exhaust gases must be determined indirectly. To do this it is necessary to carry out a series of tests and analyzes that will enable parameterization of operating conditions. The article presents the relationships between the concentration of harmful compounds in the exhaust and the load on the marine gas turbine engine. These relationships were obtained on the basis of the tests carried out on the LM 2500 engines used on the FFG-7 missile frigate ship.

Keywords: gasturbine, vessel, emission, pollution;



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Non-isolated voltage and current measurement of SOC batteries connected in series

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Abstract

The aim of this article is design of non-isolated voltage and current measurement for traction battery module. The measured voltages and currents are further used for requirements on SOC determination of the individual batteries. Traction lead batteries are recommended to maintain SOC values within 30% - 100%. This is related to proper monitoring of the SOC to be able to achieve long battery life and to prevent deep discharge. Therefore, it is important to monitor the instantaneous battery voltage, current flowing through the battery and according to implement proper methodology for SOC estimation. The nominal battery voltage of investigated batteries is 12V and the maximum current flowing from the battery is 150A. The batteries will be charged and discharged during operation, which requires a bi-directional current measurement. The specified number of batteries connected in series is 3, and the measuring circuit must also be adjusted for this requirement. The measured battery voltage will be further processed by the microcontroller via A / D converters for the requirements on SOC determination. For this reason, the required output voltage range for the designed measuring circuit is 0V-3.3V.

Keywords: SOC, voltage sense, current sense, batteries, measurement



Analysis of the effect of the fuel dose on selected parameters of the diesel engine start-up process

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Abstract

As commonly known during the operation of technical facilities their property operating parameters are changed, this also applies to internal combustion engines. It is connected with the influence of working and external factors on the internal combustion engine. In order for a technical device powered by an internal combustion engine to be able to perform the given utility functions, the internal combustion engine must undertake an independent operation. This article presents selected results of tests of the diesel engine start-up process. The results of the impact of fuel injection parameters (fuel dose) on selected parameters of the diesel engine start-up process are presented.

Keywords: Diesel engine, start-up, fuel dose, operational



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Analysis of the influence of slewing bearing mounting on their static load capacity

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Abstract

The main scientific goal of the article is to modernize the methods of designing the rotating mechanisms of working machines (excavators, cranes, backhoe loaders, loaders) and other devices (wind turbines, radars, radio telescopes, drilling machines, wastewater treatment plants) in which the construction of the rotate node uses slewing bearings.

In this article, the research will focus on how to mount the bearing to the machine.

The calculations will be carried out by numerical modelling of bearings and support structures of machines using the finite element method with the wide use of non-linear FEM techniques and taking into account the elastic-plastic state of deformation in the contact zone. In the research, the ADINA program will be used as the basic numerical calculation tool.

Keywords: slewing bearings; bolt connections; load capacity bearings, FEM



Evaluation of the engine technical condition based on criterial analysis of exhaust emission indicators

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Abstract

Changing of some engine structure parameters affects the emission of harmful components in the exhaust. This applies mainly to damages occurring in the charge exchange system as well as in the fuel system and the engine supercharging system. Changes in emission of harmful compounds are often ambiguous, because they depend to a large extent on the parameters that shape the combustion process. An additional problem is that often simple interactions occur with the interaction of these parameters. It is, therefore, possible to speak about different sensitivity of diagnostic parameters to the same extortion from the engine structure, but implemented in different load states. In the paper, the authors propose a methodology for the classification of acquired diagnostic parameters using the Hellwig's information capacity indicator method, which is the basis for building a ranking of diagnostic parameters based on the zero unitarisation method. At the same time, the diagnostic model of the engine will be presented, based on the theory of multi-equation models, in which the diagnostic symptoms are indicators and characteristics of the emission of gaseous exhaust components.

The research confirmed the existence of a strictly defined relationship between the structure parameters of the studied engine systems and the toxic emission factors. All the features of the initial parameter were also positively confirmed as a diagnostic parameter, i.e.: unambiguity, sensitivity and availability. This allowed for an optimal selection of engine work areas in which the response dynamics (sensitivity) of the adopted parameters is the greatest. The research methodology used allows for the formulation of general conclusions and thus the wider application of collected empirical material.

Keywords: diagnostic, theory of experiments, marine diesel engine, exhaust gas toxicity, multi-equation models;



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Designing a new exhaust pipe of the cogeneration unit for the charging station for electromobiles

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Abstract

The thesis describes modification of the cogeneration unit's exhaust pipe, which is intended for the charging station for electric vehicles. The goal of the redevelopment is to create a modular construction. The proposed design will greatly increase the efficiency of the whole plant as the newly designed exhaust system concept with low exhaust backpressure values and its location on the cogeneration unit meets the requisite emission and noise scatter. Such a concept can also be used in other areas of transport systems.

Keywords: Cogeneration unit, exhaust gas diversion, exhaust pipe.



The impact of the unbalanced rear wheel on the vibrating comfort of the child seat

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Abstract

The paper presents the results of research on the assessment of vibration comfort of child seats in a passenger car. The research involved the impact of wheel unbalance on the size and frequency characteristics of vibrations to which a small passenger is exposed - a child transported in a standard car seat placed on the back of a car. The studies recorded the acceleration of the car floor, the seat of the child seat and the seat of the car under the child seat, for various speeds. The results were analyzed to determine the intensity of the vibrations generated by the unbalanced wheel. Based on the obtained results, the degree of vibration comfort of the child seat has been assessed.

Keywords: Comfort, child seat, vibrating comfort, car child seat



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Assessment of the selected parameters of aerodynamics for Airbus A380 aircraft on the basis of CFD tests

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Abstract

This article presents a several-step method for estimating selected aerodynamic parameters and characteristics of an aircraft. The proposed method is based on the analysis of the CFD simulation results of the aircraft model on the example of the Airbus A380. The first stage of the research concerns the determination of aerodynamic force component values: lift force and drag under specific flight conditions, and determination of lift force coefficient and drag coefficient values. As part of the work, the comparison of the lift force coefficient values and drag coefficient depending on the angle of attack in order to determine its optimal value was made. The second stage of research concerns the estimation of the operational ceiling and the maximum ceiling of the Airbus A380 aircraft based on the standard atmosphere parameters and model simulation results for the optimal angle of attack. The proposed test method allows determining the height characteristics of aerodynamic force components depending on the speed of the aircraft flight, and can be used as a method of supporting the design stage of aircraft constructions.

Keywords: aircraft, aerodynamic force, lift force, drag force



Study of design and layout of UAVs 3D printed wings in relation to optimal lightweight and load distribution

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Abstract

Greater technical advancement of Unmanned Aerial Vehicles (UAVs) used in air traffic means their possible use not only for entertainment and leisure. UAV technology in the military industry has opened up ground scanning capabilities for various purposes. Optimized design and 3D printing capabilities make it possible to apply UAVs beyond military use, for example, for Search and Rescue or Coast Guard applications that use the long range UAVs. The authors compared the proposed design of wings made with 3D printing. Optimized design of wings for the needs of long range UAVs forms the basis for implementation of UAV systems to life-saving applications. Several designs have been printed during the design process and the one that achieved the best results based on stress test have been printed out of multiple materials to achieve maximum strength. The results of the article show different designs of wings construction, their comparison with loading and selection of the optimal layout of the wing parts of the wing structure.

Keywords: 3D print, UAV, Wing Design, Load Tests, Flight Performance



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Topic 4 ECONOMICS AND MANAGEMENT IN TRANSPORT

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Optimization of using recuperative braking energy on a double-track railway line

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Abstract

In the introduction, possible ways of reusing energy from recuperation are presented. Next, the paper investigates the possibility of using regenerative braking in the range allowed by the detailed timetable by adopting the method of transferring the recovered electric energy directly to the catenary and immediate use of this energy by another train at the same power section.

In the main part of the work, it is shown, that the use of energy recovered from regenerative braking can be optimized by controlling the arrival time of the train to the station within the range allowed by the detailed timetable. The possibilities of using the adopted method are shown on the example of "Tricity" (metropolis of Gdansk, Sopot, Gdynia) suburban railway line no. 250.

Finally, selected optimization results are presented and a simplified analysis of the financial benefits resulting from the use and optimization of regenerative braking is presented.

Keywords: transport; railway, optimization, recuperative braking



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Logistics Projects in the Czech Republic

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Abstract

Logistics is becoming a fast-growing industry with an endless amount of logistics projects. We find such a definition just with Polish authors. Domestic and other authors do not use the concept of logistics projects, but we find in the specific literature terms such as city logistics project, urban logistics project, or reverse logistics project. These concepts are about projects which focus on logistics in the cities than in the total concept of logistics projects. The paper will deal with the idea of logistics projects regarding business firms in the Czech Republic. The main objective of the paper is defining logistics projects.

Keywords: Logistics Projects; Logistics, Risk, Risk Management



Designing of logistics systems with using of computer simulation and emulation

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Abstract

Designing of logistics systems with using computer simulation and emulation is the main part of effective optimization of manufacturing and warehousing in the company. Latest developments in software tools lead to research in use of computer simulation and emulation, before, during and after logistics system designing. The aim of our research is to describe the logistics system designing by using of computer simulation and emulation with connecting on real parts of logistic system. Through this connection, we can propose a material flow which could improve the speed and accuracy of picking of orders in warehouse or supplies of material to manufacturing. Solution described in this article has many practical applications in company's operation. Future work will explore the possibility of connecting between computer simulation, emulation and Digital Twin.

Keywords: designing; logistics; computer simulation; emulation



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The use of computer simulation in the company that carries out the assembly of products

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Abstract

The paper deals with the implementation of computer simulation in the assembly company in terms of an innovative solution for new production planning, optimization of workplaces and cost-effectiveness. By computer simulation, three variants of the layout of a new assembly workplace created by the company were assessed. The computer simulation verified whether the variants of the new assembly workplace meet the specified requirements. Subsequently, a variant was selected that met the specified requirements and was recommended to the company. After the assembly workplace was realized, an experiment was carried out using the final assembly worker. During the experiment was identified the use of the final assembly worker and suggested variants with the use of the worker, which were subsequently simulated. During the experiment was identified the use of the final assembly worker and were created variants with the use of the worker, which were subsequently simulated. Based on the simulation results, a variant with a higher percentage of worker use was selected. The result of the presented solution was to make the use of wage costs per worker more efficient. The results from computer simulation allowed the company to make judgments about the possibility of investing in the purchase of simulation software or the use of parametric models created by external companies.

Keywords: Simulation; simulation project; simulation model; worker utilisation



Online reputation in the transport and logistics field

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Abstract

Nowadays, the Internet is getting more and more to the forefront. Customers use the Internet more frequently for communication, search for information essential for their purchasing decision, but also for online shopping. Customers become very demanding and they increase their requirements on companies. Enterprises are trying to meet customers needs and demands in the best possible way. For this reason, their efforts focus on optimization of their processes and on as quickly as possible products delivery to customers. Companies should therefore focus on their reputation in the online environment. This paper deals with issues of online reputation in the field of transport and logistics. The paper analyzes the impacts and consequences of the online reputation neglect in the transport and logistics field. Available statistics and data from which we could deduce connections with online reputation were analyzed. Recommendations were subsequently proposed. These recommendations can be used by companies to improve their reputation and gain competitiveness.

Keywords: reputation; online reputation; logistics;



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Research on the relationship between transport performance in road freight transport and revenues from excise duty on diesel fuel in selected European countries

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Abstract

Countries of Europe have different levels of mineral oil taxes. These rates of tax are also reflected in the prices of fuel. In the case of freight transport the demand for pumping diesel fuel and the choice of the state of drawdown itself can be affected. Consequently it is possible to examine how the choice of excise duty on mineral oils affects the transport performance in road freight transport. The article deals with the analysis of relations in selected European countries between transport performance and the choice of excise duties on diesel fuel. To examine these dependencies, the methods of regression and correlation of relationships were used. The outputs of the article are useful when deciding to set the amount of excise duty on diesel fuel. Also the possibility of introducing a refund of part of these taxes only for road carriers and bus operators.

Keywords: mineral oil taxes, road freight transport, transport performance



Identification of change seasonality of demand to transportation in road freight transport

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Abstract

On the price of road freight transport significantly impacts demand to the provided transport services. With insufficient transport offer the carrier is forced to realized a ride with vehicle without a shipment or leave the vehicle in downtime until the moment gaining transportation. Both options increase carrier costs related to the transported operations. The purpose of this article is to verify scientific hypothesis, whether it changes and optionally to what extent, offer of transport on defined territory during a specific time period. To test the seted hypothesis will be based from two specific periods within the calendar year. It will be identified return shipping offer. The goal of the article is also pointing to risks, which arise during transport, when the carrier fails to find for their vehicles transport to address of their company.

Keywords: road transport; freight transport; transportation; seasonality; demand



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The Danube river and its importance on the Danube countries in cargo transport

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Abstract

Inland water transport belongs to the most sufficient modes of transport within transport of bulk, general, liquid cargoes including containers. Economic, transport and territorial aspects have to be in line so that this mode of transport could work properly. It is also necessary to have enough waterways that link the hinterland with sea ports. The Danube River that is the second longest river in Europe flows through ten European countries. In spite of its length, the volume of cargo has been lower than on the Rhine and its tributaries as the result of some aspects that have happened in the Danube countries since the 1990s. The main goal of the paper is to focus on status quo of transport on the Danube, analyze of strengths and weaknesses and prepare the measures that could help to improve this situation.

Keywords: Danube river; inland navigation; SWOT analysis; prediction



Identification of letterbox companies in the road transport sector

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Abstract

The paper deals with issues of letterbox companies, which are one of the main problems of the European road transport market. Some European road transport companies establish letterbox companies in countries with low labor costs and weak enforcement. These companies then carry out transport operations mainly outside the country in which they are registered. While there is a lack of significant empirical evidence on the scale of this problem, it is an important issue and a classic example of social dumping or unfair competition in Europe. The aim of this contribution is to identify the undesirable influence of letterbox companies on competition in the European Union. The aim of the paper is also to verify that the creation of letterbox companies is not only related to the problem of non-compliance, but also to the issue of social dumping which is being investigated in the conditions of the Slovak Republic.

Keywords: letterbox company; transport sector; establishment; social dumping; labor



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Transport management in Polish cities in the context of the European sustainable transport concept

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Abstract

The transport sector plays a huge role in the era of increased mobility of citizens of the Community and permanently growing needs related to trade, both within the European Union and between its countries and other regions. Considering the intensive impact of the transport sector on the state of nature, the notion of sustainable transport was created that is a priority for the creation of program documents related to the EU Common Transport Policy. The main objective of the European Union's transport policy is to strive for sustainable transport development. This balance is based on shaping the demand for transport and such a division of resources, that on the one hand there will be no difficulty in access, and on the other, that there will be no congestion and excessive nuisance for the environment. Paper presents an analysis of data on the organization of sustainable transport in Polish cities as one of the strategic areas for the development of urban agglomerations, which significantly improve the quality of life.

Keywords: sustainable development; transport; smart city



Variants of air navigation service providers’ business models

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Abstract

Several national markets with air navigation services have been fundamentally transforming for past couple of years. From purely protectionist environments, with one monopolistic air navigation service provider to partly liberalized markets opened for free competition. As a reaction to this situation, various air navigation service providers started to shift their orientation towards commercial form of revenues and importance of business models started to rapidly emerge. Paper contains new, comprehensive definition of business model related to ANSPs. Paper also propose methodology for categorization ANPSs into business models, based on relevant attributes focused on evaluating level of commercial interest of ANPSs using simple mathematical model. Three business models based on degree of commercial interest of are proposed as part of categorization methodology.

Keywords: *business model; air navigation service providers; ANSPs, liberalization; commercialization; commercial activities*



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Do the Slovak Airports need the State Economic Framework for Financial Support?

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Abstract

The regional airports represent not only important points of access to remote locations and parts of country but they also have major economic impact on the surrounding regions. Every public airport with commercial operations is obliged to fulfill strict requirements in connection to international safety and security requirements, which are virtually the same for small and large airports and results in high operational costs. Subsequently, small airports face several problems and it is difficult for them to break even, not only due to low throughput volumes but also limited other resources of income which represents the substantial part of middle and large airport revenues. Furthermore, small airports (with an annual throughput under 200 000 passengers) are considered not to be able to cover their operational costs and therefore, must be subsidized. Regional airports have been studied in several studies, but never with using the standard tools of ex ante financial analysis. That is why this paper pursues the actual economic situation and its further development prediction of regional airports within the Slovak Republic, while focusing on the detailed financial-economic analysis and financial situation prediction (to highlight the role of analysis through financial reports in the prediction of paying difficulties) of two regional and four “small” regional airports, through the financial stability evaluation of all abovementioned airport companies for the period of last five years, with the use of two most famous value and bankruptcy models: IN05 index created by Inka and Ivan Neumaier and the Kralicek Quick test. The main focus was given on determining the two groups of indicator’s influence, such as financial stability and efficiency, meaning the financial situation consideration. Within the analysis, we also focused on the extent of companies’ self-reliance calculation and time of their debt elimination, as well. On the basis of our research, the conclusions and several recommendations for the airports’ operators were formulated.

Keywords: slovak regional airport, legal framework, financial support, ex ante financial analysis, IN05 index, Kralicek Quick test



How digital transformation can influence business model, Case study for transport industry

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Abstract

The digital disruption is a situation which occurs in nowadays business very often. With the development of digital technologies, the classical system of doing business has been disrupted and many companies have to react to digitalization. The digital transformation brings innovations not only into the delivering of product. The companies are trying to rebuild a waterfall approach to agile by using a platform. The aim of this paper is to describe how the transport companies which start their business before digital disruption can change business model according to digitalization. It will include identifying current trends in digital transformation. The case study deals with the process of designing the new tool for recording hours spent by the employees on the different activities or projects typical for transport industry, value or supply chain of transport services and is based on the agile approach.

Keywords: digital disruption; agile approach; Design Thinking; digital workplace; transport



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Identifying the derived utility function of transport services: case study of rail and sea container transport

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Abstract

The paper defines derived utility function of rail and sea container transport. Container transport refers to the transportation of goods in standardized re-sealable transportation boxes by rail and sea. The utility theory is mostly connected with the consumer and consumption theory. When thinking of transport services, demand (consumer) and suppliers influence the decision making process of transport. For this reason, authors have decided to derive the utility function of these transport services. Three key factors are identified: environmental efficiency, time and transportation capacity

Keywords: Utility; transport; rail; sea; container



Impact of Digital Technologies on Labor Market and the Transport Sector

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Abstract

The economy and society as we know is constantly changing. One of the key drivers of this change is digital transformation. Digital transformation is based not only on the internet but above all on the latest digital technologies that have become an integral part of our lives. They affect not only our society and economy but also transport industry. The process of digitalization has created opportunities for new products, technologies and processes. On the other hand, digitalization or so called digital disruption has brought threats with it. This threats, like in every other industrial revolution are in the form of new challenges for employers and employees. Digital technologies as well as digital services change the rules of employment and the requirements of competences, knowledge, skills and attitudes of employees. Beginning to promote online work platforms, changing local and global labor markets. Based on this facts, the aim of this paper is to analyze, define and characterize the impact of digital technologies on the labor market and its potential impact in the field of transport labor market.

Keywords: Automation; Digital technologies; Labor market; Employment; Transport Sector



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Trends of scale-up effects of ICT sector

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Abstract

The knowledge transfer is essential for future success not only of the enterprise but the sector and the economy as a whole. The ability of a knowledge transfer produce value and make the enterprise more successful. There is a clear evidence that ICT sector may positively influence enterprise competitiveness but also social and environmental issues as well. The paper deals with scale-up effects of ICT sector and the importance of the university-industry knowledge transfer as well.

Keywords: scale-up effects; ICT sector; university-industry knowledge transfer



Simulation of Queuing System of Post Office

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Abstract

The paper displays the usage of simulation method as a tool for optimizing costs of particular post office. For this research specific post office was selected. This post office is situated in town Bytca. The starting point for solving more complicated optimization tasks is to create a system model that includes elements of reality and the relationships between these elements. Simulation methods make it possible to eliminate the most of the obstacles that arise from the analytical solution of queuing systems such as queuing system of post office. In contrast to the analytical solution, the stochastic elements of the system are captured by an algorithm in the order to generate the value of random variables in simulation model. The dynamic properties of the system are captured by the time step variable method. The aim of this paper is to use simulation method and optimize number of service counters in the way to save costs. The model of the queuing system that is used in this article is based on two types of events – customer arrival and end of customer service. The model was designed to provide the results of system characteristics. Simultaneous experiments give us the ability to analyze system characteristics and declare conclusions about the system.

Keywords: arrival rate; queuing system; post office; service time, simulation model



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Concept of Smart Postal Mailbox

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Abstract

This paper is devoted to the issue of smart postal mailboxes that are used for delivery of postal items without a personal presence of addressees. The main objective of paper is to introduce an application of the smart postal mailbox. Basic function of the application is to detect a presence of consignment in the mailbox. Solution of smart postal mailbox consists of hardware and software part. Hardware part of the application includes design of postal mailbox and the choice of relevant components providing particular smart functions. Software part of the smart postal mailbox ensures correct operations of hardware components. Application is created in integrated development environment Arduino.

Keywords: Smart postal mailbox; Internet of Things; Hardware; Software; Arduino.



The image of the postal company as a key attribute of the customer's purchasing behaviour

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Abstract

The paper focuses on the issue of image assessment as a significant attribute of the customer's purchasing behaviour in the postal market. The image of the postal company undertaking consists of a number of factors that are under analyse and research. The goal of the paper is to describe the properties of the set of several variables by using fewer variables (factors). Subsequently with a reduced number of factors, it is possible to draw a conclusion about the interdependence of the original variables. Factor analysis is used for this purpose. The results of the research in question will enable the postal company to identify priorities for building a positive image in relation to customer's purchasing behaviour.

Keywords: image; factor analysis; postal operator; scree plot; correlation matrix.



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Model of waste transportation management in the conditions of a production company

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Abstract

In today's economic environment, the problem of pollution of the environment due to anthropocentric pressure becomes of particular urgency. Among the most important ecological, economic and social problems of humanity is the problem of solid household waste. Practical experience of waste recycling in Ukraine, Russia and other countries testifies to the fact that the unique universal method of their utilization has not yet been developed. The purpose of the paper is to research the methods for reducing industrial waste by the example of a brick factory, namely, what types of waste is formed at the enterprise. The main results of this research are to define the common model of waste transportation management and to determine the main stages of its occurrence and to propose effective methods for its formation.

Keywords: waste at the enterprise, waste processing, waste recycling problem, waste management logistics, model of waste transportation.



Classification of roads according to the HCM6 method and its application in Polish conditions

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Abstract

The development of the road network and the increasing volume of traffic causes more problems with capacity and deteriorating traffic conditions. This may be a direct cause of making wrong decisions and actions to improve the road traffic flow on road sections. In order to eliminate the traffic congestion and improve the traffic flow, it is necessary to determine the traffic parameters, and based on them to indicate the capacity and a level of service. One of the most commonly used methods for estimating capacity and traffic conditions is the Highway Capacity Manual method. This methodology was developed in the United States and is based on the conditions and parameters of traffic occurring in this country. Authors in the paper indicate problems related to the use of this methodology in Polish conditions, based on the tests results obtained for the section of the national road. Differences between conditions in Poland and in the USA occur already at the stage of division of roads into groups. The proposition of the classification of all national roads to transit routes may cause significant analysis errors. The authors of the HCM method assume the occurrence of high speeds on transit roads and this parameter determines the level of service. In the case of some national roads in Poland, their route runs through built-up areas where administrative speed restrictions and additional restrictions are arranged to improve safety. Such a situation may cause an error at the beginning of the analysis, in determining the level of service. This may be a direct cause of making wrong decisions and actions to improve the road traffic flow on road sections. The lack of proper interpretation of the HCM method may cause significant errors in the analysis results. The authors in the article pay attention to the characteristic parameters of the road infrastructure, which may have a significant impact on these errors.

Keywords: Level of service; capacity; road class; HCM



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Road User Effects Related to Pavement Degradation Based on the Highway Development and Management Tools

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Abstract

The article describes the history of research in Road User Effects Models and current knowledge in the area. It stakes out basic principles such as transport cost categories, forces opposing motion, free speeds and vehicle operating cost calculation principles. It presents a method to calculate travel time savings and vehicle operating costs savings related to repair of pavement at a certain state of degradation by utilization of the third generation of Highway Design and Maintenance (HDM-III) Road User Cost coefficients. A method to derive a model for Road User Cost calculation related to pavement degradation levels from contemporary Highway Development and Management Tools (HDM-4) is presented. Case study highlights the different outcomes when these models are used and results for selected vehicle categories are provided in conclusion of this article.

Keywords: Pavement degradation; Highway development and management tools; Road User Cost calculation; HDM-III



The amount of subsidy for the electric vehicle in Slovakia through a strategic cost calculation

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Abstract

The issue of environmental protection and the effort to the green transport is becoming more popular to public. In order to reduce negative impacts of transport, Europe should to move towards a more sustainable circular economy and green transport system. This paper deals with the problem of using the methodical procedure of life cycle cost calculation for quantification of subsidy for the sale of electric vehicles in Slovakia. The main aim is to highlight the current state of the investment and operational demands acquisition vehicle with electric engine compared with conventional combustion engine, as well as the future direction of the transport solutions.

Keywords: electric vehicle; subsidy; LCC calculation; cost



TRANSCOM 2019, 29 – 31 May 2019
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Calculation of External Costs from Production of Direct and Indirect Emissions from Traffic Operation

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Abstract

The paper addresses the issue of the internalisation of the external costs of direct and indirect emissions from traffic operation on the transport route, on the section of the transport route as well as on the transport of one shipment in freight and one passenger in the bus transport. Existing emission calculators do not allow the calculation of external costs from traffic in the environmental impact of transport services. The article deals with design of methodology for calculator of direct and indirect emissions and the internalisation of external costs of transport services for different types of vehicles in road transport.

Keywords: direct emissions; indirect emissions; public transport; freight transport; external costs



Equity fare system: Factors affecting fare structure in integrated passenger transport

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Abstract

Public passenger transport is a socially beneficial service available to everyone as opposed to personal vehicle transport. Striving for an equity fare system, that is, preventing transport disadvantage, is one of the basic principles of public passenger transport. This paper outlines all the criteria that affect the implementation of equity fare system in integrated public transport, as well as their correlation and impact on the implementation itself.

Keywords: equity fare system; integrated passenger transport; transport disadvantage.



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The current state of the application of risk management in the transport sector

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Abstract

The SMEs are considered to be the most flexible, the most effective and the most progressive part of the economy both in the developed countries and in Slovakia. The SMEs are very sensitive to the changes in the entrepreneurial environment and therefore it is important for them to know the risks that threaten their business activities. Several studies worldwide say that a reliable risk management ensures fewer negative surprises, a higher financial stability of the company and provides opportunities for achieving profits.

The aim of this paper is assessment the perceived key business risks of SMEs in Slovakia in transport sector based on own empirical research carried out in 2017. Its task was to detect the state of the risk management in the enterprises too. The overall results of the empirical research point to the need and importance of addressing the assessment of key risks and their resources in SMEs in Slovakia. The role of the paper is, through a relevant study, to highlight the need to apply risk management in the SMEs and to bring closer the results of the research in Slovakia to world trends.

Keywords: small and medium enterprises, environment, risk assessment, transport sector



Comparison of transport problems in process of evacuation

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Abstract

Current global environment affects formation of crisis events, which have fluctuant nature nowadays. In order to effectively protect human life, health, and property crisis managers should use new methods, techniques and tools. It is necessary to solve crisis events and give more attention to prevent crisis events. Crisis managers should analyze new systematic approaches, which are used to support of decision-making processes. The aim of the article is to describe selected methods, which may be used in process of evacuation planning. The article highlights possibilities of use transport problems in process of evacuation planning. Selected decision-making processes in the field of evacuation transport are analyzed in this article.

Keywords: crisis management; crisis events; evacuation; transport problems; decision-making processes



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The design of manufacturing line configurations with multiagent logistics system

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Abstract

The beginning of the article defines current issues in manufacturing production lines which are classified into three categories. The next part is dedicated to the solution of these problems via core characteristics of reconfigurability and their application to particular problems of designing and optimization of manufacturing configuration. Based on these characteristics was created an algorithm for the design of the reconfigurable manufacturing line configuration. The suggested reconfigurable line configurations with multiagent logistic system are verified through simulation models. The simulation results are compared with the classic design of the dedicated manufacturing line for each part of the product family. The article concludes with recommendations for an application of these systems for improvement of flexibility and adaptability of current manufacturing systems.

Keywords: reconfigurability; manufacturing lines; simulation; multiagent logistic system



Data collection for ergonomic evaluation at logistics workplaces using sensor system

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Abstract

The rapid technological development of the society is aimed at the gradual replacement of the human work force by machines. However, man with his thinking is still the most flexible, and at the same time, the most vulnerable entity in every production system. Introducing the ideas of Industry 4.0, it is necessary to understand how human activities are transformed and how we can use technology to ensure physical and mental health protection for workers in time with increasing demands on quality and speed of production. This article deals with the intelligent collection of data in the field of ergonomics, which are needed to assess the mental and physical load on workers, and brings forward possible solutions in the form of sensor systems.

Keywords: ergonomic evaluation; data collection; heart rate; wireless sensor system



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Quality factors of transport process

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Abstract

The shortest definition of a process says a process is a transformation of input requirements in the output of the process, materialized in a product or a service. In transport, the process is a set of interrelated or interacting activities, which transforms a customer requirement as an input for transport into transport service provided in accordance with the customer requirement. To do this, it seeks to achieve the required level of service quality. For the services at the required quality level, it is necessary to reach the required level of quality of each process activity, in each process step of the transport process. A number of factors affect the quality of the transport process. In this paper, by using general and special scientific methods of cognition, the authors explore the factors of transport process quality and explain their influence on the process quality. The approach presented in this paper, with some adaptation, applies to the research of quality of all types of transport.

Keywords: quality factors; process; quality of transport process

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New Curriculum Development in V4 Countries

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Abstract

The Article explores the possible curriculum development for master studies in the field of Humanitarian Logistics to benefit the V4 countries. The article looks at rationale of developing such curriculum and how it should be different to standard curriculum in Logistics. Next the paper proposes the example framework for such curriculum.

Keywords: Curriculum development, humanitarian logistics, visegrad countries



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Evaluation of quality of services provided by transport & logistics operator from pharmaceutical industry for improvement purposes

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Abstract

The article presents the results related to the evaluation of the quality of services provided by a transport & logistics operator from the pharmaceutical industry for the purposes of improvement. The quality of services was assessed with the SERVQUAL method and its tool – a survey conducted among 30 companies from the pharmaceutical industry, customers of the researched operator. A statistical evaluation of results was performed as a part of subsequent statements in the expectations and perception section along with their comparative analysis intended to determine the size of gaps. The results have been generalized for five dimensions of service quality. Unweighted and weighted SERVQUAL results were calculated. Expectations regarding the quality of services provided by the researched operator were higher than the actually obtained quality level – this concerned all aspects and dimensions of service quality under evaluation. The obtained results were the basis to determine the order which some improvement actions were undertaken in. When it comes to the examined operator, their service quality dimensions which must be improved first of all, is reliability, then tangible, assurance, responsiveness, while empathy gained the best scoring from the "worst" dimensions. It was suggested to take measures intended to improve the quality of services provided by the researched operator in relation to the verified five dimensions of quality. Application of the SERVQUAL method to assess the quality of services provided allows to identify any weak quality features and dimensions and provides a basis to set a direction for the improvement activities.

Keywords: transport & logistics service, pharmaceutical industry, quality of services, SERVQUAL, improvement



The quality standardization in suburban bus transport by the transformation of the service quality loop

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Abstract

The article is dealing with the standardization of quality level in total approach it means the transformation of the service quality loop by STN EN 13816. The quality loop reflects the rating of the service provided from the point of view of the customer as well as from the operators (authorities) point of view. Individual quality aspects are closely related. The aim is to minimize the differences between the expected and the provided quality in order to stabilize the passenger demand. The article includes the possible approaches and methods for determining the standard service quality level in suburban bus transport which are based on the results of real measurements in Zilina self-governing region in specific years.

Keywords: quality; criterion; satisfaction; importance; standardization; quality loop



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The current state of project risk management in the transport sector

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Abstract

Nowadays enterprises are focused on successfully project, which are managed by project managers. The project must to fulfill basic projects expectations and setting project objectives. It is necessary to identify project risk in the planning phase. Base on risks, which are managed by project managers. Than managers may manage projects more successfully and use mitigation to prevent projects from failing. The main aim of this paper is to describe the current state of project risk assessment in Visegrad Group countries in transport sector, based on empirical research, which was realized by authors in 2018/2019. This research was focused on analyzed the current state of project risk assessment in Europe, Asia, Africa and America. The main aim of this contribution is to assess the current state of project risk management of Visegrad four countries (V4) based on empirical research in transport sector.

Keywords: Project risk management. risk, transport, current state



Risk management in traditional and agile project management

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Abstract

The dynamic development of the business environment has stimulated the efforts of managers for agile project management. This is mainly due to shortening time limits for project realization as well as vaguely set objectives that change during project implementation. The requirements on project managers and methodological risk management of projects have also changed. Organizations use projects to manage changes and to develop and deploy new products. In a competitive environment, only those who can manage the risks and realize the project more efficiently will succeed. The aim of the article is to highlight the importance of risk management and the possibilities of its implementation in traditional and agile approaches to project management.

Keywords: risk; project; risk management; agile approach; transportation company



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Application of multicriteria decision-making methods for the optimal evacuation

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Abstract

Crisis events every day endanger human society. New research in crisis management assume that number of crisis events will increase. It creates a new assumption to protect life, property, and the environment. Crisis management fulfills its roles in ever more complex conditions, nowadays. It is necessary to increase to use effectiveness crisis management. The efficiency of crisis management can use new integrating methods into management processes. In this article, multicriteria decision-making methods are used and compared by criteria, which was established. Based on this, may crisis management authorities choose the processes of crisis solution. Main goal of this contribution is application of decision-making methods, which may be used in evacuation process.

Keywords: crisis management; crisis events; evacuation; transport problems; decision-making processes



The strategy for implementation of the digitization in factories

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Abstract

Implementation of the digitization and growth of the manufacturing processes intelligence are increasingly becoming necessity in today's factories. Digitization and globalization are opening new market opportunities, in particular for small factories. The realization of the Digital Factory is the strategic goal of many factories for the next years. Previous researches been limited to a lack of information from small and medium-sized factories. Small and medium-sized factories play an important role in our and Europe's economy. This paper investigates how to solve the digitization and the manufacturing and auxiliary systems designing in the factory with regard to the digitization and the dynamic market. This is very important step for creating of intelligent and autonomous transport systems. Described model is one of the most rapid ways to transform the classical (conventional) factory to modern Digital Factory. Propose model has many beneficial applications in real life of the factory environment. Achieved results offer vital evidence for possibility of the digitization in small and medium-sized factories. This approach has the real potential for increasing of the factories competitiveness.

Keywords: digitization; transport; strategy; auxiliary processes; logistics; autonomous things; service processes



The efficiency of investment in human capital in IT enterprises

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Abstract

The paper presents some of the results of the research with the orientation on human capital and its efficiency. Human capital, as the sum of intangible qualities and features such as knowledge, skills, abilities, attitudes and talent, represents an essential resource for the value creation, mainly within the field of knowledge-intensive industries. This is, for example, the case of the enterprises conducting business in the environment of information technology, more specifically, the enterprises creating software products or providing the services related. Within this paper, the broad topic of human capital is approached from the perspective of investment in this intangible asset. The attention is paid to the forms and focus of investment efforts of enterprises. An important question is whether these efforts are in alignment with what is considered to be the most important in the present, rapidly-changing environment. Proper investment in human capital is necessary for the enterprise to become flexible enough to be able to adapt to new, emerging trends. However, when investing in the human capital available, enterprises need to deal with the efficiency of this activity as well. Therefore, they need proper ways of evaluating whether the investment was efficient. The paper presents suggestions for the solution of this matter, based on the opinions of academics, other researchers and especially the practitioners – the managers of enterprises. The investment in human capital needs to be connected to the metrics and indicators suitably representing the performance and the competitiveness of enterprises. The methods for the evaluation of the efficiency of investment in human capital must be specific enough to capture the essence of this asset but, at the same time, they need to be applicable for the operation of enterprises and for their managerial processes. The characteristic features of such investment cannot be omitted since they affect the substantial parts of the whole evaluation. For example, there is a significant imminent risk of losing an employee who was the target of valuable investment in his/her human capital when he/she decides to leave the enterprise. This underpins the purpose of research within the field of efficiency of investment in human capital as one of the core issues of the concept denoted as human capital management.

The aim of this paper is to reveal the current situation of the process of investment in human capital being performed in IT enterprises operating in the Slovak Republic. These enterprises with their solutions have an important role in the sector of transport as well, as it is described in the paper. Two groups of data were used. The primary data were represented by the answers of human resources managers to the questions in the survey. This questionnaire survey was conducted in 2018, focusing on IT enterprises operating in the Slovak Republic. The enterprises were addressed directly, on a random basis. There were 115 IT enterprises participating in this research. The secondary data represented the opinions of software developers working in the Slovak Republic, collected by a professional organization in 2018. There were 617 respondents answering the questions. The methods of statistical description and analysis of the data included the frequencies of individual answers with their total percentages and the χ^2 test applied to identify possible associative relationship between the sets of categorical data entries.

Keywords: human capital; investment; IT enterprise; transport; efficiency



Social costs of the road project in the operation phase

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Abstract

The project of road is defined by sequences of phases, which create the life cycle of road. At each phase of the life cycle are arisen specified types of costs. At the operation phase arise significant capital costs, which are necessary for the road management, maintenance and repairs of roads. Besides of the capital costs, the social costs are also a part of the operation costs. The social costs are monetizing negative impacts from the road traffic to the road users, society and environment. The capital and social costs of the road operation are a part of the economic evaluation of the road infrastructure projects. Maintenances, repairs and works on roads limit the road operation. Work constraints on the road create so-called work zones. Negative impacts of road zones to road users and society are not part of the economic evaluation of road projects in Slovakia. The main negative impact of work zones to the road users is the loss of travel times. For this reason, was made a procedure for calculating and monetizing travel time costs due to work zones. The main purpose of this procedure is effective planning of road works with the aim of reduction negative impact to the road users. This quantification procedure of travel time costs due to work zones was applied to practical example.

Keywords: social costs, road project, road operation phase, work zone, travel time costs



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Topic 5 INFORMATICS AND SAFETY IN TRANSPORT

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Authors are responsible for language and content of their abstracts.



Digitisation of train command and control

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Abstract

The paper presents the practical results of some of the projects done by the Russian Railways company with the direct involvement of JSC NIIS researchers and developers. The focus is made on the vision and challenges of ongoing digitisation of command and control in view of transition to new paradigms of train separation, train detection and localization.

Keywords: Digitisation; Virtual block; Moving block; GNSS; Digital map; Distributed acoustic system.



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Improved train simulation with speed control algorithm

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Abstract

This paper describes an advanced train simulation based on a classical mathematical model, which was modified to increase simulation accuracy, especially for simulating run of long trains. The simulation also includes a train speed controller and a power consumption calculation. The speed controller can also calculate an optimal speed for a desired run time between stops. These modifications enable accurate train simulation, which can be used during locomotive development or during operational changes for given trains on selected routes. To improve usability a simple graphical user interface is used. This interface allows simple addition of input data, for example new locomotive characteristics or another track.

Keywords: train simulation; train length; speed control



Possibilities of implementing satellite navigation elements in the field of railway transport

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Abstract

The paper is focused on the implementation of elements of satellite navigation systems in the field of railway traffic. More specifically, it presents several functionalities that can either be implemented to the current technological and information systems, or serve for a new digital assistive device whose system is based on the location detected through the navigation system. It can generate outputs for the engine driver as well as for the infrastructure manager's employees. The main target is not to replace railway signaling systems, but to raise awareness, to improve the comfort of employees and to reduce the occurrence of undesirable situations.

Keywords: transport; navigation; satellite systems; railway transport;



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Map of traffic accidents

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Abstract

The society is currently facing a period of information explosion. This term represents a sharp increase in the information provided and the increase in demand for them. The information explosion is based on the integration of information and communication technologies that fundamentally affect social relationships and processes.

Information systems are also part of information and communication technologies aimed at mapping traffic accidents in a particular region. The information systems of the United Kingdom, the United States, and the Czech Republic focus on traffic accidents and make them accessible to the general public. These countries can be an inspiration for the Slovak Republic. The contribution will describe the proposal of the information system for the creation of a map of traffic accidents in the selected area, which would display not only sections of frequent traffic accidents but also other specifics of traffic accidents. These might include the importance of the incident that takes into account the number of people killed/injured, the severity of the injury to the participants in the accident, the age of the accident, the cause of the accident, the amount of the material damage, etc. Such statistically processed and evaluated information can provide the basis for the development of relevant technical and organizational measures to improve road safety.

Keywords: information system, traffic accidents, mapping, security;



Human engineering in school zones

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Abstract

School zones represent specific locations that are very difficult to manage, primarily due to the category of traffic users and then because of the characteristics of the environment itself. In certain time periods, the most frequent users of these zones are the most vulnerable groups: children or parents with children, and for this reason typical traffic solutions often do not give the desired result regarding the regulation and organization of the mentioned zones. In the Republic of Serbia such locations are spatially very often part of the "zone 30" or near them, which requires the use of different traffic signs and different project solutions. Dynamic traffic as well as parked vehicles, further complicate the situation, primarily because they make difficulties in traffic management, while on the other hand, they prevent drivers from perceiving children in a timely manner. For the above reasons, different solutions and higher level of management are required in these locations. These solutions must be intuitively logical and simple for all traffic users and especially for children, bearing in mind their behavior and characteristics. For years, traffic trends have been giving interesting solutions to these problems. The two ideas that will be applied in this paper are the concept of human engineering, which is focused on people and applied to bring engineering closer to the real needs of man, that is, to respond to the problems of contemporary society, combined with the current IoT (Internet of Things) concept. The aim of this paper is to give the conceptual solution of the selected school zone in Belgrade, through the concepts of IoT and Human engineering, with the idea of improving the communication and traffic safety and creating a comfortable environment for all users.

Keywords: design for all; Internet of Things; school zones, traffic safety;



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Development of a system for collecting and processing sky images and meteorological data used for weather prediction

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Abstract

Weather prediction is a crucial element for power management in photovoltaic power plants (PVPP). In this paper, we propose a novel system for collecting essential data used for local short-term weather prediction. Image data consists of all-sky ground-based images obtained by an all-sky camera system with a fish-eye lens. Our proposed weather station collects meteorological data into database. The data include air temperature, humidity, wind speed, relative pressure, and spectrum of solar radiation. First, the whole setup for obtaining all-sky images is described, and setup for weather station is proposed. Then, our all-sky image database is characterized. Finally, to test sky images an experiment was performed to determine sky condition (clear sky, partly cloudy, mostly cloudy, overcast) with the use of a deep convolutional neural network (CNN). The accuracy of this method reached 97,80%.

Keywords: all-sky camera, weather forecast, sky images, fish-eye lens, deep convolutional neural network



Possible Health Impacts of Advanced Vehicles Wireless Technologies

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Abstract

Modern vehicles contain various security systems including vehicular networking where vehicles receive relevant traffic information using wireless communications from their peers. This wireless communication is mediated by the radiofrequency electromagnetic field. Exposure to electromagnetic fields caused by the transportation system is a cause of concern for many people. Plenty of dosimetric analysis of electromagnetic field carried out by various research groups found out the highest exposure values in the transport. How long-term effects of these fields affect the human organism and what is the mechanism of action, are questions without known answers. Several studies point to the possible association of different diseases with electromagnetic field exposure. The key to understanding the effect of the electromagnetic field on the human organism is to reveal the mechanism of action of these fields.

Keywords: Intelligent Transportation System, wireless communications, electromagnetic field, health impact, IPR, exposure of EMF;



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An Efficient Adjustment of Genetic Algorithm for Pareto Front Determination

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Abstract

The Pareto front determination is an important part of multiobjective problem solving when two or more contradictory objectives must be considered. This paper deals with the emergency service system design problem where the demand for minimal average response time stands in opposition to the demand that maximal travel time over all users should be as small as possible. On the contrary to the iterative approach employing mathematical programming, we focus on adjustment of genetic algorithm which builds the Pareto front by updating an elite set of individuals. As the genetic algorithm belongs to the family of metaheuristics, it is commonly awaited that its performance is very sensitive to setting of its parameters. That is why the focus of this paper is devoted to such method of parameter setting, which is most suitable for efficient estimate Pareto front determination by the genetic algorithm.

Keywords: genetic algorithm, Pareto front domination, multicriteria p-median problem, emergency service system, parameter tuning;



Application of vision systems to the navigation of mobile robots using markers

Małgorzata Łaganowska

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Abstract

The paper presents a vision system for navigation a mobile robot using markers. This is done by identifying the location of the object in space by means of a marker that has been detected. The first stage of the algorithm is calibration of the camera using a checker board and read the calibration parameters. The next step is to detect the marker and then determine its actual location. Parameters of detected objects can be used to control vehicle movement. The image processing algorithms included in the OpenCV library were used.

Keywords: vision system; image processing; marker detection



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Assesing connectivity in single and multimodal networks using Geographic Information Systems (GIS)

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Abstract

The European Union Initiative “Infrastructure for Spatial Information in the European Community” (INSPIRE), aims to ensure that spatial data infrastructures (SDI) of the members states follow common Implementing Rules (IR) for specific areas such as interoperability. SDI are considered as strategic infrastructures to develop environmental policies through the use of Geographic Information Systems (GIS). This team suggests connectivity as a crucial condition to allow network analysis with GIS. Vector GIS have their operational fundamentals based on Graphs Theory and this fact makes them suitable for networks analysis. In this paper, various methodologies, techniques and tools are proposed within the scope of the GIS, in order to be taken into account in the previous design of a network layer, in the proposal for rules of connectivity and in considerations about topology. Simple networks are logically a primary level when the goal is analyzing multimodal networks, where complexity of connectivity increases dramatically. As far as intermodality is a strategical issue in UE policies, this paper aims to highlight the importance of assessing the quality of connectivity and how to solve inconveniences about a lack of it.

Several GIS software platforms have been chosen using a common language based in the Graphs Theory, in order to ease the use of the proposed methodology with other tools. The Spatial Data Infrastructure of Andalusia (IDEA) is used as an example, as it is one of the most advanced and experienced public SDI in Europe. However, this SDI has presented connectivity faults in a roads network layer not allowing an efficient use by users and researchers from this region.

Keywords: GIS, Intermodal Networks, connectivity, topology, SDI;



Solving a Container Terminal Location Problem Using Decision Support Systems

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Abstract

University of Zilina and University of Belgrade renewed their cooperation in the field of railway traffic and engineering in 2011. The bilateral research project EFRAIL that started in 2017 was focused on increasing effectiveness of the railway transport services using decision-support systems.

At the same time, researchers of the University of Zilina started the participation on SKILLFUL project. SKILLFUL is financed under H2020. The main project vision is to identify the skills in training and education of future transport professionals.

In this paper, we present a summary of the survey focused on available simulation tools and partially on the application of mathematical models of operations research realized in frame of the EFRAIL project. We present how the decision support systems can be used for solving a container terminal location problem in the case of container terminal in Vrsac town in Serbia. Firstly, on the frame of the EFRAIL project, we used a so called "compromise programming method". Secondly, we used similar problem to develop one of lessons for railway experts' training in GIS, as our participation in the SKILLFUL project. In this lesson, main topics are spatial analysis, multi-criterial analysis based on raster layers.

Keywords: decision support system; location problem; education; compromise programming; GIS;



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Automatic music genre recognition for in-car infotainment

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Abstract

Automatic music genre recognition is fundamental tool for music retrieval, recommendation and personalisation in smart infotainment systems and music streaming services. Such systems may be helpful especially for in-car audio, because driver's interaction with such infotainment systems could become a major subject of his/her distraction. There are two important tasks to be considered for better genre classification, which present classifier and audio features extraction. In the proposed system, timbral textural and pitch content features were used for genre classification. Timbral texture includes the Mel-Frequency Cepstral Coefficients (MFCC) along with other spectral characteristics. For the pitch content the features extracted from Chroma are selected. The aim of this work is to explore possibilities of music genres classification from audio signal and to create a system for automatic recognition of music genres in the MATLAB programming environment. A functional system for recognition of music genres was developed on the GTZAN data set with ten different musical genres such as rock, pop, classical etc. We examined several classification methods including GMM, SVM, and k -NN. The experimental results show that by using both types of features, the classification accuracy of 69.7% is achieved for the k -NN classifier.

Keywords: musical genre, GMM, SVM, k -NN, automatic classification, feature extraction;



Exact approach to the electric bus fleet scheduling

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Abstract

In the recent years the research in the field of electromobility has been gaining a lot of interest. Research in the field of electromobility relates to various problems connected to the limited driving range of vehicles, locating of charging infrastructure and capacity of the electric network. These limitations should also be considered when solving the problem of transforming the public transport fleet of diesel engine busses into the fleet of electric vehicles. One of the tasks that should be solved is the problem of scheduling. This paper deals with the problem of assigning available electric buses to the set of service trips, in other words scheduling of electric buses. Electric buses have limited operation range and must be charged during the operation. Charging process needs more time than refueling of diesel busses and the number of charging points at charging station should be considered. In our case it is assumed that the charging is possible at the depot and at chosen locations. In the paper we propose a linear mathematical model that respects all necessary limitations. The performance of the model will be tested on the data set from the public transport system in the city of Zilina using a standard IP solver to evaluate the quality of the solution and computational time.

Keywords: Electric vehicles; Scheduling problem; IP solver, Exact solution, Electric busses;



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Measurement of capacitive coupled ECG from the car seat

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Abstract

The topic of the article is the design and construction of the device for measurement of ECG in the car. This device is divided into two parts: sensing part and processing part. These parts are described in detail in separated sections. The sensing part of the device was incorporated into the driver's seat. The ECG signal is measured through capacitive coupled electrodes installed in the seat that includes high-input impedance amplifier and sensing electrode surface. This sensing part of the device is capable of recording electrocardiogram data through clothing. Part of the hardware responsible for processing of the recorded signal was placed out of the seat and it is connected through shielded cable with sensing electrodes in order to reduce noise. The main part of the hardware dealing with signal digitalization and filtration utilizes analog front-end ADS1191 by Texas Instrument. It is possible to set up sampling frequency, gain of channel and configuration of RLD circuit during data acquisition. The experimental measurement and ability of the device to measure capacitive coupled ECG while driving are presented at the end of the article.

Keywords: capacitive coupling, ADS1191, unobtrusive monitor, ECG



Transfer Learning for Classification of Parking Spots using Residual Networks

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Abstract

The paper proposes a classifier with a residual convolutional architecture for visual parking spot classification into classes “empty” and “occupied”. The classifier is trained on the well-known PKLot dataset. Transfer of the resulting model to data with new challenging modalities (such as snow, partially obscured vision, reflections, mist, ...) is tested – to this end a new dataset has been collected by the authors. It is shown that the original classifier fails in some of these unfamiliar settings, but that the failure modes can successfully be corrected using transfer learning.

Keywords: deep learning; convolutional networks; parking lots; occupancy detection; residual architecture



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About eco-driving, genesis, challenges and benefits, application possibilities

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Abstract

The dynamic development of individual motorization observed in the last 2 decades, contributes to many negative phenomena occurring in road traffic and consequences for the natural environment. To counteract these negative phenomena (congestion, road accidents, emission of toxic exhaust fumes), many initiatives are taken in the field of safe use of vehicles. One of such solutions is the improvement of driving techniques and the ability to properly assess and forecast the traffic situation. This approach is known as eco-driving, and it offers the following benefits: economic, ecological and operational. The advantage of this solution is the high application potential and the ease of using eco-driving habits in various road conditions. This article describes the idea of eco-driving and presents a review of literature in this area. The authors, based on their own experience and the research results presented in the literature, carried out by various scientific and research centers from Poland and around the world, present the benefits of using this technique in practice. This article is an introduction to the eco-driving technique and a contribution to further more advanced operational tests.

Keywords: eco-driving, congestion, transport safety;



Capturing Brain Activity During Driving Automobile

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Abstract

The primary purpose of this article is to show which brain waves are activated while driving an automobile. The first part of this article deals with the theoretical information about brain waves and electroencephalogram (EEG). The activity of the brain is measured by EEG technology, which is represented by Emotiv System devices. The following section defines which devices have been selected. For measuring EEG was used headset Emotiv EPOC and for analysing measurements, the application Emotiv Brain Activity Map was used. The third part of this article focuses on the experimental section. The experimental part provides four various measurements. These measurements describe activated brain waves during different actions while driving. The last chapter of this paper is devoted to possible ways of using this technology.

Keywords: EEG; electroencephalography; Brain Computer Interface; BCI



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Preprocessing of GIS data for electric vehicle charging stations analysis and evaluation of the predictors significance

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Abstract

When a government or a municipality intends to incentivize electromobility a chicken-egg problem arises: shall citizens first buy electric vehicles or should the charging stations be installed first? Often, a charging infrastructure is deployed, even if the number of electric vehicles is small, in the hope to stimulate a larger interest in electric mobility. In such cases, charging station operators in collaboration with municipalities have to make appropriate decisions, including finding the placement of charging stations that meets the demands of electric vehicles (EVs) while expending the resources efficiently. In this paper, a data set coming from a large network of charging stations, located in one of the worlds electromobility leading countries the Netherlands, is analysed. Dataset comprises over one million charging transactions, more than 1700 charging stations and spans over four years. First, methodological tools to describe the urban context by data are introduced. Publicly available GIS data are collected and exploited to assess the geographical locations of charging stations. Data preprocessing procedures are described and their limitations are discussed. Finally, using correlation analysis the ability of the gathered GIS predictors to explain the utilization characteristics of EV charging stations is evaluated.

Keywords: electromobility, GIS, data analysis



Clustering algorithms applied to usage related segments of electric vehicle charging stations

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Abstract

Here, a data set collected within the large network of charging stations located in one of the electromobility leading countries the Netherlands, is analysed. The data set consists of more than one million charging transactions that took place in more than 1700 charging stations in the time period of four years. Clustering algorithms such as k-means, dbscan and agglomerative hierarchical clustering are applied to identify usage related segments of charging stations. The selection of features was made based on main classes of factors that are expected to define the use of charging stations (e.g. popularity, temporal characteristics, utilization). The resulting segments of charging stations are compared and interpreted. Better understanding of the charging behaviour of EV users can help improving planning of charging infrastructure and exploitation of smart charging technologies.

Keywords: electromobility, clustering, charging stations, data analysis



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Impact of Electromagnetic Fields in Transport on Active Implantable Medical Devices

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Abstract

This paper details numerical computation of induced interference voltage within a pacemaker due to exposure to electromagnetic (EM) fields present in a train. The goal is to verify whether electromagnetic field sources pose a potential threat to passengers with an implanted pacemaker. A simplified human body model with a bipolar lead configuration pacemaker was positioned in the vicinity of an electric distribution box - the source of an 50 Hz electric field influencing the pacemaker. Two positions were investigated, each placed in two different distances from the source of the electromagnetic (EM) field. The maximum calculated interference voltage in all simulated cases is within the 0,29 V/m range. This value corresponds to the input filter attenuation band and represents a safe value for train passengers with an implanted pacemaker, subject to undamaged distribution box and is in compliance with security requirements.

Keywords: pacemaker; electromagnetic fields; low frequency; induced voltage; train; distribution box



The Evaluation System to Ensure the Transport of Emergency Supplies of Fuel to the Hospitals

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Abstract

Nowadays we can see an increase of emergency and crisis. One of these may be a power outage. However, this can also be a cascade effect because of the windshield. Hospitals are a critical infrastructure sector where it is essential to ensure a constant supply of electricity. At the time of the power outage aggregates are used for which it is necessary to provide the supply of fuel. Each hospital has different stocks of fuel and therefore needs emergency supplies of this raw material. For this purpose, an assessment system is proposed for hospitals, but also for regions, which would determine the current state of fuel availability in hospitals in the area.

The aim of this paper is to introduce an assessment system for providing emergency supplies of fuel deliveries to hospitals in the event of a power outage. The paper will address hospital capacities regarding fuel stocks in the event of an outage. In the next part, the analysis of selected hospitals and their subsequent comparison will be carried out. Furthermore, the area of emergency fuel supplies for hospitals will be addressed. At the end of the paper, an assessment system will be designed to ensure the delivery of emergency fuel supplies.

Keywords: Evaluation system; emergency supply; hospitals; emergency management; critical infrastructure



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Case Study: The Use of Petrol Stations to Fuel Supply in the Event of a Power Outage

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Abstract

Long-term power outages represent a significant interference with the lives of citizens, institutions, and sector of critical infrastructure. One segment of critical infrastructure is healthcare. In this sector, it is essential to maintain functionality and provide ongoing healthcare to clients. At the time of power failure, alternative power sources are used in these facilities for which fuel supply is required. The aim of the paper is to analyze fuel filling stations for hospitals in the event of a power outage. The paper describes the use of petrol stations at the time of failure. Also, an analysis is carried out at a selected hospital regarding fuel supply and the determination of service stations for their supply. The PTV Vissim software will be used to analyze critical junction points for supply. At the end of the paper recommendations for the selected hospital will be proposed.

Keywords: Power outage; petrol station; fuel supply; Czech Republic;simulation



Improving the recovery system of damaged roads due to safety

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Abstract

Emergency occur in our country countless. In the territory of the Slovak Republic, the main causes of road traffic damage are floods. From the individual sources of information, one of the other causes of the damage is the flood wave, the submergence of the road and, last but not least, the landslide. The main triggering floods in our territory are extreme precipitation, rapid warming at high reservoirs of snow in the catchment area and, of course, torrential rainfall. These risks can seriously endanger the environment, the material values, but also the safety of life and human health. The gradual process of rehabilitation of damaged roads provides for the reduction of material losses on property and the environment and, of course, to increase the safety of the population in the affected area by an extraordinary event.

Keywords: damaged road communications, safety, emergency, recovery organization;



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Application of innovative monitoring tools for safety and alert procedures in road tunnels

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Abstract

Tunnels and underground structures are one of the most important components of road and railway networks, especially near urban areas. For this reason, it is particularly important to identify potentially hazardous conditions in order to guarantee the structure's durability and practicability. This paper presents a case study where a seismic event severely damaged a road tunnel located in Central Italy, impairing its accessibility and leading to its closure for safety reasons. Following the damage assessment, and given the importance of this specific structure, it was decided to perform a series of renovation works aimed to restore the tunnel's operability. In this context, an innovative automatic monitoring device, able to measure the structure deformation, was installed in a critical section of the road tunnel. This instrument, called Cir Array, is specifically designed for near-real time monitoring of convergence phenomena and localized deformations inside underground structures, obtaining accurate and reliable results during their operational phase. The instrumentation provided useful information about the structure's conditions, playing a major role into assessing the tunnel's accessibility and safety during the renovation works. Moreover, thanks to its automated and high frequency sampling process, it will allow the implementation of dedicated warning procedures related to the passage of the vehicles inside the tunnel.

Keywords: Tunnel; Monitoring; Early Warning System; Innovative Technologies;



Assessment of SAR in human body model with the cochlear implant inside a railway vehicle

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Abstract

This article details simulation and analysis of electromagnetic field distribution within a railway vehicle, with special focus on distribution thereof in human body phantom with a cochlear implant. Research was carried out using modelling of electromagnetic fields based on the Finite Integration Method. Simulations were performed and analysed in cases where passengers were exposed to long-term radiofrequency field stemming from the use of mobile phones during railway transport. Results were evaluated based on the specific absorption rate (SAR) – the measure of electromagnetic energy absorption in the body (in watts per kilogram [W/kg]). Dual band (900 and 1800MHz) PIFA antennas were designed and employed as radio frequency sources. The homogeneous passenger model includes a cochlear implant and dielectric properties are set according to the evaluated frequency band. Results have shown that the calculated maximum values of SAR are higher than those established within the European maximum SAR limit and additionally, the obtained values are higher than values obtained in simulation in open space.

Keywords: Railway vehicle; electromagnetic field; specific absorption rate; cochlear implant; mobile phone.; modelling and simulation



Analysis of operational parameters of the Cirrus SR22T aircraft for identification of deviations from standard operating procedures

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Abstract

Safety of air operations remains critically important in all branches of aviation. Both the maintenance and operating procedures standards are based on the identification of threats and proven strategies aimed at their elimination. Deviations from standard procedures lead to aviation accidents; therefore flight data monitoring (FDM) is a process required by aviation regulations worldwide from air carriers. Data collected during flights are analyzed to detect potentially dangerous crew actions. FDM is considered to be one of the critical success factors in the significant reduction of accidents in airline operations in recent years. However, according to the 27th Joseph T. Nail Report, accidents rates in general aviation (GA) remain significant and as high as 4,87 per 100 000 flight hours in 2015, despite the reduction of even higher values observed in the first decade of 21st century. For this reason, the general aviation industry and government bodies push new safety initiatives, among which the introduction of FDM to private and non-scheduled commercial operations seems to be promising but challenging. On a favorable side standardization in GA is poor what creates vast space for improvement. On a negative side, GA aircraft data recording capabilities are limited regarding the number of parameters and the frequency of records. Research work is required to understand better how standard operating procedures and flight data monitoring based on a limited set of data may lead to safety improvements for a specific aircraft type.

Such an initial work was carried out for the Cirrus SR22T aircraft. During the test flight, several intentional deviations from factory SOP were executed while data derived from the Cirrus Perspective by Garmin avionics suite were recorded. The recorded time series of selected operating parameters were combined and analyzed to define potential FDM events for the Cirrus SR22T. The presentation covers a few theoretical concepts, as a basis for FDM that can be applied to GA technically advanced aircraft.

Keywords: aircraft, airfoil, aerodynamic force



Safety systems components in air task domain of Tactical Aircraft Operating System

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Abstract

Tactical Aircraft Operating System (TAOS) is an anthropotechnical system that constitutes one part of tactical aircraft operation systems which are included into the third level of Tactical Air Force System. Model of the TAOS is presented in an innovative format of an aggregated analyses domain. The most essential part of the TAOS model is domain IV – air task. The air task domain presents one of the military tactical aircraft flight phases, that is treated as an air mission stage. The air task constitutes a core or purpose of the TAOS existence and functioning. There are many different types of air tasks that are performed by airmen and it is impossible to describe all of them. However, there are processes, including their operations and events, which always take place within the air tasks. An idea of general defining the air task processes became a kind of cornerstone of the considered air task model. The air task model, as a separated analyses domain, should be treated as generalized model.

The developed model of the air task is considered as an area of interests of presently being applied safety systems components that are dedicated to, among others, hazards risk reduction purposes. Generally, safety system components of military tactical aircraft fulfill different safety functions and they are divided into eight categories. The authors present selected examples of the Su-22M4 fighter-bomber aircraft safety system components within C1 category. As a result of the literature review the authors present a new approach to formal notation of selected safety system components of the Su-22M4 tactical aircraft.

Keywords: air task; air task model; risk of hazards; safety system component; categories of safety system components; safety functions



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Jet engine stationary testing in the aspect of particles emission in real operation conditions

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Abstract

The emission of particles is one of the most serious jet engines operation problems. Particle emission contributes to the development of many diseases and increases mortality among people. In the case of jet engines, a very large number of particles with small diameter are emitted, which is extremely undesirable from the perspective of human health. It is also extremely difficult to estimate particles emissions from jet engines due to the inability to measure their concentration in exhaust gases during the flight. The currently used method is the stationary determination of emission factors and the calculation of particles emissions based on them. The article shows the emission of particles from the aircraft engine in the different phases of the flight. The tests were carried out in stationary conditions on the basis of engine operation parameters during the actual flight.

Keywords: Jet engines ; particulate matter ; exhaust emissions;



The Effects of back lit Aircraft Instrument Displays on Pilots Fatigue and Performance

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Abstract

One of the latest trends in the global aviation industry is to use "smart" technologies and interfaces as time saving and efficiency tools. Larger flight instrument displays have replaced conventional, analogue, instruments and can be combined with touch screen efficiency tools. Their ever-increasing size brings with them issues relating to light emissions and eye absorption. Especially emissions of certain colours of light at certain times affecting the Pilots circadian rhythms and cause eye fatigue - which is recognised to have an impact on Pilots performance. (Davies R., 2018)

This research paper complements the current study and measurement of stress, fatigue and human factors with respect to increasing artificial light intensity experienced by Pilots on the Flight Deck. The authors present the results of several measurements taken using a flight simulator which meets the current regulations for Pilot training. However, the conditions have been adjusted to the realistic conditions of a Flight Deck. The research results provide Air Operators, Airlines and aeronautical designers with valuable data on human behaviour and the reactions to Flight Deck environmental changes.

For the purpose of our research, we decided to use eye monitoring technology to record eye movements to determine the pilot's performance. Eye monitoring provides data on the number of eye movements, fixations and the durations of these.

Keywords: Glass cockpit, Back lit, Pilots Performance, Eye Tracker, Aircraft Instruments;



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Objective Measurement of Pilot's Attention Using Eye Track Technology during IFR Flights

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Abstract

The use of Eye Tracking technology to study eye movements has been increased over the last period. For instance, in the fields of academic and scientific research, market research, medical research and human factors. Despite this fact that Eye Track technology is in many ways beneficial, it has been rarely used in the flight simulation. This paper pursues the objective measurement of pilot's attention distribution during an Instrument Flight Rules (IFR) flight. For realization, we used wireless SMI Eye Tracking Glasses, which scans pilot's eye movements when performing the prescribed flight procedures. Our study incorporated overall six test pilots divided into two groups: the experienced and inexperienced. The aforementioned measurements were performed on the ELITE S923 Flight Simulation Training Device, situated at Zilina Airport. The main objective was to determine the extent to which the scanning techniques differ in the case of experienced and inexperienced pilots, as well. As pilot's attention distribution while performing precision (ILS) approach and non-precision (NDB) instrument approach. The measurement itself, as well as subsequent data analysis, revealed that pilots were evincing considerable deviations in relation to scanning techniques and furthermore, the different scanning techniques during ILS and NDB approach were detected. The conclusion consists of several measurements' outcomes and the possibilities for utilization of Eye Tracking technology in further research.

Keywords: Eye Track; Distribution of Attention; Flight instruments; IFR; NDB; ILS



Objectification of Criteria for a Critical Infrastructure Elements in the Rail Transport Sub-sector

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Abstract

Transport has become a daily need of mankind, people go home, or to the family, to the friends, and commodities from destination to destination. Humankind as such is dependent on all modes of a transport. Transport is a part of the Critical Infrastructure sectors and has the following subsectors: road transport, air transport, water transport and rail transport. The issue of objectified identification of infrastructure objects as elements of a critical infrastructure in rail transport is a little addressed in the Slovak Republic. When exploring identification issues, it is necessary to analyze foreign sources and propose solutions as important railway infrastructure objects to be among the potential elements of critical infrastructure in the transport sector. These suggestions will be tested and my own solution will consist of multiple views that will be more closely described in the work.

Keywords: rail transport, critical infrastructure;



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Effect of a power failure on rail transport

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Abstract

Electricity is one of the most significant discoveries that science has brought to the human race. Without it at present, a person cannot exist. Electricity has become an integral part of modern life. Everyday activities, whether in households or other areas, such as healthcare, industry, transport, are dependent on electricity. In 2013, the energy sector reached such a level of significance that it was declared to be uniquely critical by the Presidential Policy Directive (PPD-21). In the rail transport sector, more and more railway lines are electrified, and the electric motors are gradually replacing diesel engines. Such modernization of the railways leads to dependence on electricity and therefore their operation can significantly cause danger by the electricity outage. Almost all technological equipment on the rail is dependent on electricity. Therefore, it is important to pay attention to the resilience of the elements on which the operation of electricity production and supply depends on other sectors dependent on electricity.

Keywords: electricity, rail transport, critical infrastructure, resilience;



Assessing vulnerability of key elements of railway infrastructure

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Abstract

An inevitable prerequisite of the security of functionality of the transport system is its protection against detrimental phenomena and incidents that could cause a negative impacts on the system itself and its users. In practice it is not possible to protect all elements of the system, and therefore it is often elected the way of the protection of key elements. Identification of the key elements is the first step for success in the field of investments, management and protection of infrastructure.

The intention of this contribution is to point out the importance of interest in the topic of the vulnerability of the system, since the infrastructure is mutually connected and dependent, and the failure of one element may cause functioning of a large extent. In this contribution, we will explore the theoretical approaches of the vulnerability of the railway system. The identification of critical elements of the railway network can help its administrators to assist in raising the resistance.

Keywords: rail transport; key elements; vulnerability



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Implementation of Safe City Concept – Procedure of Choosing New Safety Measures

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Abstract

Over the studies of Smart and Safe City concepts number of solutions increasing the safety and security in cities were identified. However, as every city faces different problems in different circumstances, the same solution will not bring the same results everywhere. Individualistic planning of safety and security enhancements is needed. The aim of this paper is to help with decision-making processes - to identify, which safety and security solutions are the most fitting for the specific situation of the specific city. For this purpose, part of the *methodological procedure of implementation of Safe City concept solutions* is presented within this paper for discussion. In this paper, I decided to deal with the part of procedure that seems to be the least addressed of them – with decision support for choosing new safety measures for implementation. The whole methodological procedure is to be created within an interactive webpage guide.

Keywords: safe city; support of decision making; identifying suitable solutions



Application analyses of state of evolution – ETA on selected extraordinary events

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Abstract

The issue of traffic accidents on the railway crossings is a serious global problem projected in all spheres of human activity, therefore it requires a comprehensive and rational approach. The article is focused on the application of the tree events analysis – ETA on the most frequent accidental events on the railway crossings in the Slovak Republic. In this direction we might have a traffic accident for better understanding as a result of a complex of all sorts and action. The Factor of Human Failure is mostly reported as the primary cause.

Keywords: railway crossings, analysis, safety, accidental events



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Security of pipelines in natural gas distribution network

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Abstract

A large number of gas facilities across the territory of Slovak Republic could be the target of criminal actions, a lot of them could be easily sabotaged. These facilities are usually located in isolated places (away from the towns and cities), thus making them subject to attacks and violent actions. Despite existing protection on those facilities, they are still vulnerable to being attacked or completely destroyed by intruders. This paper addresses the above listed problems and offers some recommendations and potential solutions to increase the security level of gas facilities, which are part of Critical Infrastructure of Slovak Republic.

Keywords: natural gas, distribution network, security, pipeline, integrity;



Simulation of detonation and blast waves propagation

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Abstract

Among the priorities of the Slovak Republic we consider the protection of elements of critical infrastructure, indispensably including the transport infrastructure, which has to be constantly improve and modernize. Researching the protection of these elements, part of the researchers is focusing on ways to protect assets from the blast effects. An explosion can't be solely caused due to a terrorist attack or other violent crime. Most frequent causes include electrical short circuits, gas pipeline disturbances, or vehicle crashes, which can cause transportation collapse for up to a few days. Before realization of the blast protection of assets, a number of simulations are required to provide the necessary information for application of a suitable way how to secure a selected critical infrastructure element. The most important issue is to know the blast waves propagation and their mitigation. The paper is focused on the various simulation methods to simulate the blast wave propagation as pressure-time function, compressed balloon, mapping algorithm or solid TNT.

Keywords: transport infrastructure; blast protection; numerical simulation; blast wave



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Risk and the result of the fire in multistorey car park

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Abstract

Most of big city inhabitant's places face the issue of the parking and lack of parking. Missing place was solved with multistorey car park, bringing advantages together with certain danger. New fire safety requirements and firemen rescue works are needed. The paper describes public multistorey car park houses by steel structure. The main topic of the paper is to analyze thermo-mechanical load of the structure located in selected transport company determined for parking. Software tools and mathematical selected modeling will be used. Results obtained in modeling will be compared with the simplified results according to standard methodology. Critical heat of steel element is set in dependence of the usage ratio use scale.

Keywords: IPE 500, Mathematical modeling, multistorey car park, steel structure, thermo-mechanical load;



Preparation of Crisis Managers in Countries of Visegrad Group with Focus on Simulations

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Abstract

Simulations are used nowadays as a tool to support decision-making processes in many institutions and different fields around the world. Progress in the field of information and simulation technologies has significant impact on the way we respond to crises at different levels of government and management. In this paper the preparation of crisis managers in countries of Visegrad Group in context of European Union with focus on simulation and use of transportation in crisis situations is described. Within this paper is comparison of four Visegrad countries presented.

Keywords: Crisis Management, Preparation, Simulation, Visegrad Group;



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Specifics of Monitoring and Analysing Emergencies in Information Systems

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Abstract

The information systems serve as tools for collecting information in connection with emergencies and their monitoring. The database eMars according to the SEVESO III Directive which comprises data from all member states serves for collecting information about major industrial accidents in the EU. According to the type and extent of an emergency, in Slovakia the industrial accidents are registered in two databases and two ministries keep files on them – the Ministry of Interior and the Ministry of Environment and are assessed according to different parameters. The first one is the information system of the civil protection managed by the Ministry of Interior and the second one is the information system of the major industrial accident prevention managed by the Ministry of Environment. Regarding hazardous substances related accidents we are discussing transport of dangerous goods on the roads. The main aim of this article is to analyse the emergencies in mentioned databases and to assess the statistical data which are involved in all information systems.

Keywords: information systems, database, industrial accident, dangerous goods, hazardous substances;



The method of optimal route selection in road transport of dangerous goods

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Abstract

Dangerous goods such as: liquid fuels, chlorine, ammonia, gases, corrosives, radioactive material, toxic and other substances are being transported by road in Poland on a daily basis. 'Dangerous goods' are materials or items with hazardous properties which, if not properly controlled, present a potential hazard to human health and safety, infrastructure and or their means of transport. However, from year to year a systematic growth of accidents of the substances mentioned has been observed. It is estimated that several hundred traffic collisions, involving vehicles carrying hazardous goods, are being registered. Those accidents lead to spills penetrating into the soil, groundwater and watercourses, causing degradation of biological life. Therefore, the question of safety is an important problem that must be faced by senders, recipients and transport companies. One way of improving safety conditions is risk assessment. Therefore, in the article present the method of selection model of road transportation of dangerous goods. The model generates routes that are optimal from the perspective of risk and losses minimization. In addition, the paper adopts the results of simulation research selected delivery routes in Poland, with the use of the Breadth First Search algorithm (BFS) and proprietary application called the Safest Path Finder.

Keywords: dangerous goods, risk assesment, breadth first search algorithm, optimal routes.



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Evaluation of selected input parameters in tunnel fire modelling

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Abstract

Fire safety in tunnels is one of the most important parts of their design. Inadequate design assumptions may lead to significant life and property loss and severe damage to the tunnel construction. This paper presents an impact analysis of the selected input parameters on the outcomes of a computer fire model relating to fire severity, tenability and exposure of construction. Variability and uncertainty of the design fire size and wind speed are examined in the Fire Dynamics Simulator and compared to the results of a real-scale tunnel fire test. The results of the presented model cases underline the importance of the evaluated input parameters in relation to evacuation, construction damage and rescue operations.

Keywords: tunnel fire; FDS; CFD modeling of fire; wind in tunnels; inside wall temperature; smoke movement; HRR



Factors Influencing the Performance of Critical Land Transport Infrastructure Elements

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Abstract

Land transport infrastructure provides services essential to a modern society's functioning. Transport infrastructure elements such as road and railway structures are used every day by more and more people, and disruption to or failure of these elements would have a broad impact. The importance of these elements depends on the level of performance they provide, i.e., their traffic-carrying capacity and traffic intensity. This performance can be affected by negative factors such as the escalation, exposure, de-escalation and intensity of undesirable events. However, the effects of these negative factors can be minimized by positive factors that improve the resilience of transport infrastructure elements. These factors include the robustness, recoverability and adaptability of transport structures. The article aims to integrate definitions and describe how factors negatively or positively influence the performance of critical land transport infrastructure elements.

Keywords: critical infrastructure; critical element; land transport; disruption; performance; traffic-carrying capacity; traffic intensity



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The problem of proper cargo securing in road transport – case study

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Abstract

Incorrect securing of cargo or lack of security is the cause of several hundred accidents a year and yet the issue of securing goods is neglected by drivers. The cargo carried in the vehicle becomes the object of interest of the control services only when the load leaves the vehicle in an uncontrolled manner. This is due to the fact that the provisions for securing cargo in road transport are very general and do not specify how it should be secured. The general provisions of law also mean that the majority of transport participants consider that it is impossible to check the correctness of the load securing. The article analyzes the fixing of free-standing cargo using fastening belts. The protection was made by method top-over lashing. The number of fastening belts should be determined by methods: on the basis of tables prepared by fastening belts manufacturers (Dolezych), analytical calculations using the formulas contained in the DIN – EN 12195/2 and using the “TMO model course 3.18. Safe packing of CTU’s. Quick lashing guide road+sea area A”. Differences in the number of lashing selected using the above methods are indicated. Methods have been described for reducing the amount of fastening belts necessary. In the following part, the analysis of the force distribution in the fastening belt-load combination in the top-over lashing method was performed. The analysis was used to indicate the simplifications in the formulas allowing calculation of the force pressing the load to the ground. The real impact of the fastening belts on the load causing uneven stress distribution on the ground and decrease of forces in the fastening belts on the edges of the load are described.

Keywords: fastening belts; cargo securing; transport safety



Possibility of transmission system disruption by intruder

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Abstract

Information is represented in a variety of ways, most often it is a message, a figure, a value, a fact, or other data about a certain event, a phenomenon, the primary function of which is to reduce or eliminate ignorance in a certain area. We could say that most often the information is informative and helps the recipient. Information is measurable and almost always should have its addressee. Each information can be described in terms of its two pages, quantitative and qualitative. The quantitative information page is important from the point of view of its automated processing and the quantitative description of the adequacy of the factual representation. Information is only effective for the recipient in the case of a full, undamaged condition. Incomplete or damaged information may in some cases be optional, non-informative, for the recipient.

The basic prerequisite for delivering the full form of information through the message is the correct and flawless functioning of the transmission system. The transmission system consists of three basic parts which cooperate with each other. The first part is the transmitting device, located in one object, the second part is the receiving device in a different object. The last and most significant part is the transmission path through which information is transferred from one device to another.

Scientific research at the Department of Security Management at the Faculty of Security Engineering, University of Žilina, we focused on testing ways to prevent transmission of information on the transmitter side. The purpose of the practical tests was to verify the most common ways of disabling the ability of the transmitting device to send information via the transmission system. During the planning of the tests, we assumed that one of the options to devalue the information is to prevent its full submission.

Keywords: information, practical testing, transmission system, prevention, broadcasting device;



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Dependencies of elements recognized as critical infrastructure of the state

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Abstract

Critical infrastructure and the network of its interconnections have a complicated and not fully recognized character. The analysis of the literature on the subject allows to register the fact that individual authors perceive the multidimensionality of the dependence, which means the relationship between elements defined as critical infrastructure. The dependencies cause that elements of critical infrastructure have the so-called "double dimension". On the one hand, they determine the efficiency of the functioning of critical infrastructures, on the other hand they increase their susceptibility to all kinds of disruptions.

In practice, this means that any disturbances in the functioning of one of the critical infrastructures negatively affect other dependents.

Keywords: dependences, critical infrastructure, classification of critical infrastructure, matrix of dependence



Level of occupational stress, personality and traffic incidents. Comparative study of public and freight transport drivers.

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Abstract

The matter of road safety is particularly important in modern transport systems. This is due to the fact that despite the high level of technical sophistication of transport safety systems, the number of road incidents is relatively high. Generally speaking, transport safety is understood as control over various possible traffic hazards. Road conditions or vehicles damage is not the only source of threat in transport. Drivers and their personality traits affect the occurrence of risk situations and impediments while driving on public roads. Professional drivers should especially be characterized by their efficiency in controlling their reactions because they are responsible not only for transported goods but also for other people. Subjective assessment of drivers' personality and the level of occupational stress may impact not only on their functioning but also the quality of driving and safe behaviors on the road. For this reason, studies determining the relationship between personality traits and stress in professional drivers are important. The authors of the article attempted to define these relations using surveys among public and freight transport drivers (N=150). They represented two transport companies from the Lublin City: Miejskie Przedsiębiorstwo Komunikacji (City Bus Company) and Poczta Polska (Polish Mail). Eysenck Impulsiveness-Venturesomeness-Empathy Questionnaire (Eysenck, 2006) and Questionnaire for Subjective Assessment of Work (Dudek et. al, 2004) were used in the study. Based on the above-mentioned questionnaires, statistical analyses were carried out using specialized statistical software SPSS Statistics, based on which the relationship between personality traits and the subjective assessment of occupational stress were determined. The results showed that there are statistically significant differences between research groups and there is a positive correlation between personality traits and work stress. Finally, there was also found the correlation between different types of traffic incidents.

Keywords: personality, occupational stress, professional drivers; traffic incidents; safety; driving behaviours;



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Evaluation and analysis of emergency events in road tunnels

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Abstract

The article deals with the evaluation and analysis of the emergency events and using in EMUT application, which is a special program for evidence and evaluation of the emergency events in the road tunnels. Tunnel safety is to be understood as a system consisting of infrastructure, external conditions and impacts. Traffic in road tunnels is more dangerous than on surrounding roads because of limited traffic areas with no daylight, with limited fresh air and less escape possibilities. Tunnel safety requires a number of measures concerning tunnel construction, safety equipment including traffic signs, traffic management, emergency training and information to tunnel users. Incident records from individual road tunnels of Slovakia are processed in the EMUT application, where it is easier to work with them, select, compare and create graphical outputs.

Keywords: road tunnel; emergency event; operator; training; safety;



Co-operation of the control logic of the T-shape road intersection and the near railway level crossing

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Abstract

The paper deals with the problem of traffic control in the situation when controlled road intersection of the T-shape is situated close to the railway level crossing. That configuration very often brings some additional risks resulting from the phenomenon known as “blocking back”, i.e. blocking movement of road vehicles found at the level crossing when a train is approaching and passing. There are various approaches how to eliminate that risk, one of them consisting in establishing co-operation between both installations and proper modification of signal control phasing of the near controlled road intersection. The authors briefly analyze and discuss the problem, its potential solutions and present applied approach in the form of the animated UML-based model.

Keywords: road; railway; traffic; control; model; risk; UML



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The human factor and maritime safety

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Abstract

Studies of maritime accidents identify human error as the primary contributing cause for up to 70% of the accidents. By investigating incidents, safety problems can be identified, and preventive measures may be taken. This paper deals with incorporate human factors into an accident investigation program. In order to provide an examples of a human factors taxonomy for the purpose of investigation, the Human Factor Analysis and Classification System (HFACS), was used. The fundamental issue of the HFACS system is the proper categorisation of the causal factors in one of nineteen sections, known as “coding process”.

In this paper, the recommendations for the proper classification of causal factors, focused on marine transport, will be provided.

Keywords: human factor, failure, accident, maritime, sea, vessel, master



Automatic testing of control functions for programmable control systems in transport applications

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Abstract

Nowadays a software is a part of most modern systems which enables automatic control of transport processes. During development of control system, it is necessary for each application to deal with testing of correct behavior of control functions which are implemented by software. For simple control systems it is possible to test the system manually in short time, but for complex systems the manual testing has very high requirements on the time. Also, human factor can have an influence on results of the test. For these reasons the automatic testing and evaluation of test cases is preferable. The paper deals with a way to realize an automatic testing and evaluation of control functions in transport. This way of testing minimizes impact of human factor on correct evaluation of test cases and can reduce test time.

Keywords: Testing; Programmable control systems; Testing in transport, Automatic testing, ETCS



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Possibilities of tracking city indicators in the sense of the Smart city concept

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Abstract

The paper deals with the current trends in the use of digital, information and communication technologies in Slovak cities in the sense of Smart city concept. The role of these systems is to provide simple and clear evidence and tracking of city performance indicators in areas such as city cleanliness, transport infrastructure, city management, security, health care, culture, sports, and so on. For this, cities can use different data acquisition methods, different ways of processing, interpreting, and other uses.

Keywords: Smart city; Information, Transport; Traffic



Disruptive acts in cyberspace, steps to improve cyber resilience at National Level

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Abstract

Basic prerequisite for cyber resilience is to identify elements of cyberspace that can be easily exploited for disruptive acts. This article discusses what are those elements and how do they affect governments, public and private sector focused on transportation. Subsequently, it scrutinizes the findings against statistical data of selected countries. The article concludes by summarizing the most evident steps governments should take to improve the cyber resilience.

Keywords: Cyber resilience; Information and communication technologies; Cybersecurity, Cyber threats; Transportation



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Energy Efficient Software Defined Networking Algorithm for Wireless Sensor Networks

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Abstract

The real-time properties and operational constraints of Wireless Sensor Networks (WSNs) have emerged the need for designing energy efficient routing protocols. Recently, software defined network based WSN (SDN-WSN) emerging technology has offered a significant development by untying control logic plane from the low power sensor nodes. This centralized programmable control still suffers from several configuration challenges in distributed sensors environment. Meta-heuristic based SDN approaches had been proposed for the efficient path selection in WSN but they still suffer from both, exploration and exploitation problems. Therefore, this paper addresses these shortcomings by proposing a meta-heuristic based dolphin echolocation algorithm (DEA) for optimizing route selection in WSNs. Objective function of the DEA algorithm is to consider the residual energy of the nodes for selecting energy efficient routes. The proposed algorithm performance is compared with several meta-heuristic algorithms in terms of energy-consumption, and network throughput parameters.

Keywords: Software defined networks; energy efficient routing; wireless sensor networks; optimization techniques; adaptive dolphin echolocation algorithm;

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