ŽILINSKÁ UNIVERZITA V ŽILINE

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under the auspices of

Jozef Jandacka
Rector of the University of Žilina

BOOK OF ABSTRACTS

VIRTUAL CONFERENCE
26 May – 28 May 2021

Slovak Republic

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Preface

TRANSCOM 2021: 14th International scientific conference on sustainable, modern and safe transport aim to establish and expand international contacts and cooperation. The main purpose of the conference is to provide young scientists with an encouraging and stimulating environment in which they present the 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. The conference is organized for PhD students and young scientists up to the age of 35 and their tutors. Young workers are expected to present the results they had achieved.

This TRANSCOM 2021 is organized as a virtual conference because of the current pandemic situation. We hope, that this virtual mode of the conference will also be useful for all participants.

Topics of TRANSCOM 2021 are focused on transportation in these areas:

- Operation and Economics in Transport
- Mechanical Engineering in Transport
- Electrical Engineering in Transport
- Civil Engineering in Transport
- Management Science and Informatics in Transport
- Safety and Security Engineering in Transport
- Travel and Tourism Studies in Transport Development

The conference is organized by the University of Žilina. At present, more than 7,500 students are being educated at seven faculties in 184 accredited fields of study in all forms and degrees of university studies at the University. In its over 65 years of successful existence, it has become the alma mater for more than 80,000 graduates, highly skilled professionals specializing mostly in transport and technical fields as well as in management, marketing or humanities. The quality and readiness of our graduates for the needs of practice are proved by long-term high interest in hiring them by employers that cooperate with the University in the recruitment process. For more details, see: www.uniza.sk.

The 14th international scientific conference of PhD students and young scientists on sustainable, modern and safe transport TRANSCOM 2021 was held under the auspices of prof. Ing. Jozef Jandacka, PhD., Rector of the University of Žilina.

This TRANSCOM 2021 is organized as a virtual conference on May 26 – 28, 2021. 236 papers were presented by Scientific researchers and PhD students at this conference.

The full papers will be published in Elsevier – in the Procedia entitled Transportation Research Procedia.

Guest editors

Professor Ján Bujňák
Department of Structures and Bridges - University of Žilina, Slovak Republic

Professor Mario Guagliano
Department of Mechanics – Politecnico di Milano, Italy

All papers were reviewed by two reviewers.

The official language of the conference: English

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TOPIC 1: Operation and Economics in Transport

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Authors are responsible for language and content of their abstracts.

Examination of the results of the vehicles technical inspections in relation to the average age of vehicles in selected EU states

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Abstract

The contribution examines the assessment of the technical condition of vehicles at periodical technical inspection stations in selected ten EU states in 2019 and the average age of the vehicle fleet in these states. It then compares the results of technical inspections with the average age of vehicles in selected EU states and looks for a connection between them.

Keywords: periodical technical inspection station; technical inspection; temporary roadworthiness; non-roadworthiness of vehicles; assessment of technical condition of vehicles; road traffic safety; road transport

Inland navigation on the Danube and the Rhine waterways

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Abstract

The aim of this paper is to compare the inland river transport on the Danube and the Rhine according to different aspects. Different historical and economic development of countries in the western, central and eastern Europe led to differences related to dimensions of vessels, canals and lock chambers. The development of ports on the Rhine and the Danube is also slightly connected to the historical and economic development. Comparison of inland navigation on the Danube and the Rhine and activities in ports are the fundamental of the future development of cooperation between different parts of Europe. Thanks to comparisons like this one it is possible to create new frameworks of the future development of inland waterways in Europe. In the future, better connections between river systems will certainly have a positive effect on the development of transport and economic conditions of countries along these rivers.

Keywords: port, navigation, comparison

Modernization of Digital Technologies at Regional Airports and its Potential Impact on the Cost Reduction

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Abstract

Airports are no longer places used only for taking off and landing. We consider them to be institutions of great economic and social importance. They are economic generators and have an impact on the development of tourism and business in the regions. The constant level of gradually rising costs, competition and new trends have made airports more focused on the use of new technologies. Nowadays, these have become a trend. Airports are constantly adapting to digitization standards. They create various concepts and processes with a focus on more efficient, safer, and faster operation, technological innovation, and overall passenger's satisfaction. However, security and safety remain a top priority for airports. Airports are open to technological innovation, but digitization is different for regional airports. For them, modern technologies represent an opportunity, but also an investment challenge. Most of them do not have enough funds for digital transformation, therefore they remain with the traditional airport concept. The performance and reliability of each deployed system needs to be tested, and this takes time. Nevertheless, the digital transformation can significantly help with this type of airport. The paper is focused on finding out how much the regional airport can save on costs if it opts for digitization technology.

Keywords: smart airports, airport digital transformation, airport modernization, cost reduction, check-in kiosk.

Car Parking User's Behavior Using News Articles Mining Based Approach

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Abstract

Studying individual's parking choice behavior can considerably contribute towards evidence-based policing in urban area. This study investigates evidence gathered by mining Finland news article API concerning car parking associated topics in order to comprehend user's behavior and identify potential unforeseen circumstances that may impact users' decisions and preferences. The study follows a natural language processing research pipeline, emphasizing word co-occurrence analysis, sentiment score and named-entity monitoring. The results can be exploited by local authorities to develop further evidence based policing in city urban planning.

Keywords: parking analysis; parking investigation; parking issue Finland; NLP analysis.

Examination of the development of the number and use of trucks up to 3.5 tons total weight

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Abstract

In EU Member States, it is still the case that, except where provided for by national law, the rules on access to the occupation of road transport operator do not apply to undertakings engaged in the occupation of road transport operator exclusively by motor vehicles with a maximum permissible laden weight not exceeding 3,5 tonnes or combination vehicle with the specified maximum weight. The European Commission has pointed out for long time that the number of such companies or vehicles operating both nationally and internationally are also growing. In order to avoid possible gaps and to ensure, through common rules, a minimum level of professionalisation in the sector in which vehicles used exclusively for the carriage of goods with a maximum permissible laden weight not exceeding 3,5 tonnes are used, thereby approximating the conditions of competition between all operators. Requirements for access to the profession should become mandatory for operators using motor vehicles or combinations of vehicles intended exclusively for the carriage of goods in international transport, the maximum permissible laden weight of which exceeds 2.5 tonnes but does not exceed 3.5 tonnes. Therefore, the aim of the paper is to examine the development of the number of trucks up to 3.5 tons in the past time in the Slovak Republic and Poland, but also their use in traffic surveys on a selected transport network in the Slovak Republic. The results of the survey show a relatively large share of these vehicles in the statistics of newly registered vehicles as well as a large share in the traffic flow and on the highway between the two countries. Tightening the requirements for access to the profession and introducing the obligation for digital tachographs to control the driver's driving mode will have implications for logistical planning, especially for long-distance express services.

Keywords: freight transport, vehicles up to 3.5 ton, traffic survey

Possibility to reveal creative accounting when determining the value of the forwarding company's assets

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Abstract

Procedures and methods for determining the value of a transport or forwarding company are different. The purpose of determining the value of the company, what results the company reports and also who performs the valuation has a significant influence on the choice of the method. In addition to various other influences, the expert must also take into account the possibility of the existence of interventions in the transport and forwarding company's accounting. Creative accounting practices follow from the theory of accounting, but they record distorted economic changes in the company according to the wishes of various entities. The most common reason is the reduction of the tax base, but the rare case is, on the contrary, the artificial improvement of the achieved results. The aim of the paper is to analyze the procedures and methods for evaluating a company engaged in transport and/or forwarding and to examine the significance of possible interventions in the accounting of the company and the possibility of their detection by experts.

Keywords: forwarding; value of company; creative accounting; asset method

Influence of Shocks on Pallet Load and Cargo Securing

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Abstract

The paper deals with an evaluation of the transport experiment on D1 highway with Tatra T-815-7. The goal is to analyze the magnitude of shocks affecting the cargo during the transport with the emphasis on safety. Evaluated data was collected from three equal rides with the usage of 3-Axial Accelerometer with datalogger positioned on the fastened metal pallet in the center of the cargo space. The evaluation was performed with the usage of measured shocks (acceleration coefficients) in individual axis of descriptive statistics. The results of the analyses show somewhat significant deviations from normatively set acceleration coefficient values, especially in axis z. Despite rather a modern vehicle, drive on a highway in higher speed leads to frequent exceeding of normatively set limits, as per EN 12195-1:2011, having so a direct impact on cargo securing. The article also includes illustrative calculations of necessary securing forces for extremes in measured values and verification of used securing system parameters.

Keywords: transport experiment, cargo securing, pallet load, shocks, inertia force

Consequences of the sharing economy on passenger transport

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Abstract

We are in the age of new technologies and opportunities to save money or increase our monthly income. The sharing economy is the concept that ensures all of the above mentioned. However, the concept is still evolving globally; in Slovakia, it is only in its beginning. The main aim of the paper is to identify the passenger transport platforms based on the concept of sharing economy and specify the possible space for the development of this concept in Slovakia. To fulfil the aim, the paper is divided into introduction and theoretical background, methodology, results and discussion and conclusion. The concept of sharing economy is described in the first part, second part is devoted to the specification of own research, the third part presents results and the last part consists of the identification of the sharing economy specifics in relation to passenger transport. It can be concluded that the respondents welcome passenger transport based on the sharing economy, thus, by comparing the number of inhabitants and number of registered passenger cars in Slovakia, there are options for the development of passenger platforms based on the sharing economy based on the number of free spaces in existing cars.

Keywords: Sharing economy ; passenger transport ; platform ; costs saving ; profit.

Transportation Cost as an Important Element of a Supplier Selection Process Based on a Multi-Criteria Decision Analysis

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Abstract

Supplier selection represents one of the key procurement processes that main aim is to find the best supplier that provides products and services for the customer in high quality and for the best possible value. Since this decision-making process involves a series of problem identification, setting preferences and evaluating alternatives this activity should be supported by sophisticated methods like Multi-Criteria Decision Analysis (MCDA). It supports greatly by identifying the best alternative. In addition to that it is ensured that important elements, like transportation cost are considered and included as an inseparable part of supplier selection process.

Keywords: Transportation Cost; Multi-Criteria Decision Analysis; Supplier Selection Process

Analysis and research plan of commercial truck drivers' potentially dangerous driving behaviors caused by the changes of Regulation (EC) No. 561/2006

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Abstract

Regulation (EC) No 561/2006 - known as the Driving Time Regulation - lays down rules on driving times, breaks and rest periods for drivers of Lorries and buses to improve working conditions and road safety. A number of new amendments to this regulation were adopted on 15 July 2020. An important change has been made in connection with the extension of driving time, which may endanger road safety. The aim of the study is on the two independent types of research to verify that current regulation and the possible extension of driving time by two hours will not increase driver fatigue and risky driver behavior. The first analysis will be based on the collection of GPS data, digital tachograph data and video data of drivers faces monitored while driving. The second study will be realized on the Driving simulator SNA-211 at the University of Žilina. Data will be collected from each driver and each device and evaluated.

Keywords: driving time, fatigue, road transport,simulator, traffic safety;

Impact of the COVID-19 pandemic on employment in transport and telecommunications sectors

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Abstract

The coronavirus pandemic negatively affected the performance of the Slovak economy. The economic and employment downturn makes the Slovak Republic one of the most affected countries in the European Union. Due to the reduction of business activity and the decline in consumer demand, employers were forced to take several economic measures to mitigate the effects of the pandemic. The results of the survey show that employers in the field of transport and telecommunications most often used from changes in the organization of work and also greatly reduced the recruitment of new employees. The labour market situation has been gradually deteriorating since the beginning of 2020, with employment declining year on year in almost the whole spectrum of industries in April and May. The aim of the article is, therefore to point out the impacts of the COVID-19 pandemic on employers in the transport and telecommunications sectors and to analyze the use of government measures to support employment.

Keywords: Transport and telecommunications sectors; labour market; COVID-19 pandemic.

Customer requirements for urban public transport mobile application

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Abstract

Information and Communication Technologies have brought changes to how the modern consumer thinks, communicates and interacts with the environment. Modern ICT are great used in the transport sector, too. The intelligent transport systems, smart cart, next-gen GPS devices, mobile applications, urban transport vehicles used for online advertising are an excellent example of how easy it is to integrate new technologies into everyday life. Nowadays, the COVID-19 pandemic has fundamentally affected the use of public transport by passengers. This also led to a change in the requirements for mobile applications. The current situation in Slovakia provides very good prerequisites for the effective use of mobile applications in public transport, which can contribute to making public transport more attractive to passengers. The objective of this paper is to determine passengers' requirements and their satisfaction with the mobile applications used within urban public transport.

Keywords: Urban public transport; mobile application; customer requirements; critical to quality.

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Comparative Application of Analytical and Simulation Methods for the Combined Railway Nodes-Lines Capacity Assessment

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Abstract

Nowadays a considerable percentage of trains mature delays due to nodes and stations congestion. They are normally a combination of effects of routes conflicts in stations on lines and propagation in stations of delays suffered along the lines. In order to prevent the conflicts and minimize delays, desirable timetables should be robust; accordingly, an accurate estimation during timetable design and implementation is necessary. Goal of the research is to compare analytical and simulation methods for the assessment of railway lines and nodes capacity to pinpoint their mutual effects, analyze stability or variability of the obtained results achieved by traditional and innovative approaches. The work is included in a research framework with the final goal of optimizing the use of railway network capacity.
In order to tackle the purpose, the paper introduces synthetically the methods and applies them systematically to a complex network, including single and double track lines and various typologies of stations.

Keywords: Capacity; stations; lines; traffic conflicts; delays minimization; timetabling

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Impact of using e-CMR on neutralization of consignment note

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Abstract

Due to the fact that road freight transport of goods predominates within Europe, the most frequently used transport document is the international consignment note CMR. Its application follows from the Convention on the Contract for the International Carriage of Goods by Road (CMR). The CMR consignment note serves as proof of the conclusion of the contract of carriage and its use is subject to the condition that the place of departure and the place of delivery of the consignment must be in two different States and at least one of which must be a Contracting State to the CMR Convention. In recent years, a process known as the neutralization of transport documents, which is directly linked to the CMR consignment note, has been used in the transport sector. This is an intervention in the system of functioning of transport documents, in order to obscure the actual movement of the consignment during transport. The aim of the paper is to present the risks to the parties involved in the transport and to verify whether the transition from the paper form of the CMR consignment note to the electronic form can affect the rate of use of neutralization of the consignment note, ie its prevention.

Keywords: CMR consignment note; neutralization; risks; e-CMR;

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Increasing Security of Database During Car Monitoring

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Abstract

Nowadays, a vast data flow causes quite a problem in several sectors. One of the issues related to information growth and data volume is their appropriate storage and the securing of the data processing related security and its protection. In this era, where the data are a very sensitive commodity, an attack or data loss can mean losing user trust. Various researchers have dealt precisely with these ideas. They figured out several effective methods of preventing data loss and how to reduce attack amount either on a database or on a web site. Big data, which currently has a significant role in many statistics, are susceptible to various data losses, steal, or deletion. Possible data deletion can lead to a wrong decision about a transport situation prediction task, inaccurate result in decision support, or even to lousy diagnosis prediction in medicine. This vast amount of the problems led to the significant data amount and their security problem solution. Our article relates to data security in situations with substantial real data amount in time, which are entering the system. We suggest effective data distribution methods and a mechanism for data transfer from a database to data storage according to individual records' time parameters.

Peer-review under responsibility of the scientific committee of the TRANSCOM 2021: 14th International scientific conference on sustainable, modern and safe transport

Keywords: Real-time data security; data-warehouse; GPS-monitoring

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Determination of Operational Reliability of Firefighting Special Vehicles

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Abstract

In this paper, an analysis of the reliability and availability of special vehicles has been performed. An analysis of operational data performed using the tools of mathematical theory of reliability has been realized. The analysis was performed for four specific types of firefighting vehicles, which are operated as part of preventive and immediate firefighting activities. The achieved level of operational reliability, maintainability and availability of heavy vehicles has been determined. Subsequently, a mutual comparison of the reliability of these types of vehicles was described.

Keywords: reliability, reliability tests, confidence level, Weibull distribution, Firefighting Special vehicles

Ways of comparing the advantages of operating different types of vehicles in the fleet

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Abstract

Reliability is one of the key features of road vehicle operation. Of course, the operational costs of a vehicle or vehicle fleets are closely related to reliability. If the fleet operator, in this case operator of limestone quarry fleet, operates with older vehicle fleet and gradually renews fleet, situation occurs, where it is possible to assess the advantageousness of fleet renewal not only in terms of reliability, but also the operational costs. Thus, it is possible the retrospective assessment of the correct decisions in tenders.

Keywords: realiability; truck; Weibull distribution; limestone quarry

Methodology Proposal of Monitoring Economic Indicators in a Railway Passenger Transport Company Using Controlling Tools

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Abstract

The passenger rail transport services market is constantly opening up for new companies. The main aim of each railway undertaking providing these services is to increase its transport performance and make a profit. To achieve this goal, it is necessary to survive in a competitive environment. Also, the public services market has been opening and railway undertakings compete for the most advantageous contracts. If the company wants to manage its profit well, then it is important to monitor the key economic indicators continuously and evaluate their impact on business activities. This paper deals with controlling tools as a means of monitoring deviations in operating revenues and costs and suggests the methodology for application of this process to business practice. Proposed methodology uses various controlling tools and forms the basis for operational and strategic decision-making process in a passenger railway undertaking. The use of the methodology is also demonstrated on a model example.

Keywords: Railway passenger transport; Railway undertaking; Controlling; Economic indicators; Profit

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Attitudes of Bratislava citizens to be a crowd-shipping non-professional courier

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Abstract

This paper provides a background for studying the willingness of ordinary travellers to work as an occasional courier. The aim of the research is to understand attitudes of Bratislava citizens to be a crowd-shipping non-professionals courier during their mobility. The factors influencing the potential willingness of people to become occasional couriers (non-professional couriers) for the delivery of goods using crowd-shipping technology were analysed. To obtain the original data, questionnaire as a method of data collection was used. The research results showed that the socio-demographic characteristics of non-professional couriers (age, income) and fee value significantly influence the decision to participate in the temporary delivery market. The regression relationship between these parameters and the maximum weight of the parcel (order quantity) was determined. The document helps to assess the potential of the courier market (motivation, incentives, and potential cost of the service) for companies that are going to use the crowd-shipping service.

Keywords: order quantity, age, regression, questionnaires, fee

Assessment of possibility of "Park and ride" system in Kharkiv, Ukraine

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Abstract

The article considers the possibility of the "Park and ride" system in Kharkiv (Ukraine). Paper is based on studying the demand for parking services for incoming drivers to urban area. Analysis of methods of «park and ride» technologies was carried out. The nodes of the transport network that are suitable for the arrangement of «park and ride» lots in Kharkiv was determined. Based on the results of this review, 7 potential places were identified for the placement. In the listed nodes, full-scale examinations of the intensity and traffic flow composition were done. The processing of the survey results evaluated the intensity of traffic flow of privet cars that enter the urban area during the morning rush hour. Results of the transport demand research in the possible «park and ride» lots according to the travel distance have shown: the largest number of cars (30%) travelled at a distance of 5 to 8 km; 21% - generates a road traffic in the ranges of 2 ... 5 km and 8 ... 12 km; 11% - up to 2 km and 12% - 12 ... 16 km. The obtained results revealed generation of distribution of private cars trips based on the distance from the nodes of the possible location of «park and ride» parking lots is insufficient to determine the potential demand for parking data. The obtained data can be used in the development of urban master plans, projects of transport infrastructure facilities.

Keywords: transport trip, parking space, «park and ride» system, transport hub, transport network.

Analysis of Industry 4.0 elements in the transport process at the entrance of the train from Ukraine to Slovakia

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Abstract

Transport of goods in direct international rail transport between the Slovak Republic, the Russian Federation and Ukraine takes place through the border crossing stations Čierna nad Tisou – Čop and Maťovce – Užhorod. These border crossing points are places on a wide gauge and normal gauge line. In stations, loading, unloading and reloading of wagon consignments from wide-range to normal wagons are carried out. In both border crossing stations there is a change of mode of transport from SMGS to CIM and other services associated with such transport. An important document that significantly affects the functioning of the single railway market is the Customs Code of the European Union and its provisions. The Common Economic Area of the European Union is also a common customs area for all Member States. The attractiveness of rail transport must now lie in modern technologies. which are carried out in stations. One option is to use the resources offered by industry 4.0.

Keywords: industry 4.0; railway transport; border crossing station

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Software Support of City Logistics´ Processes

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Abstract

City logistics has increasing importance in relation to the sustainable development of urban transport. It is therefore very important that all processes related to the city logistics should be optimally planned in advance. Many software companies offer a variety of software tools, which can be used for optimization and planning in city logistic tasks. This article aims to define and describe the various processes that take place in city logistics and then demonstrate, how selected software tools can help in optimizing the whole process of city logistics.

Keywords: city logistic; computer simulation

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Research of bus transport demand and its factors using multicriteria regression analysis

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Abstract

The demand for transport is influenced by several factors. Our aim of the research was to identify the most important factors of demand (population, income, supply, and fare) and their impact on demand in relation to individual groups of passengers. Using the method of correlation analysis and the method of covariance, we examined the strength of the relationship between variables. The regression models using the regression analysis method were created. In the correlation and regression analysis, we found out whether there is a statistically significant relationship between the variables. The research has shown, in some cases, the supply of connections is not a statistically significant indicator.

Keywords: demand; demand factors; statistical significance, correlation analysis, regression analysis, covariance.

Knowledge in the center of attention - the latest approaches to the creation of the postal ecosystem

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Abstract

The paper aims to present the latest practices in creating an ecosystem in the postal sector and to present the methodology of analysis of stakeholders, who with their competencies and knowledge, strive for its effective functioning. It then outlines the position of one of the stakeholders - academic institutions and points to the specifics of the stakeholder - the University of Žilina and its role in the transfer of knowledge to the postal sector and the postal services market.

Keywords: Postal sector; knowledge; knowledge transfer; postal ecosystem; stakeholders.

A comparative analysis of tariffs in regional railway passenger transport

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Abstract

Population mobility makes up a large part of the strategic transport development policies of the European Union and the Republic of Croatia. One of the measures taken to improve the mobility of residents is the optimal tariffing in regional passenger transport. Each EU-state decides independently on how to carry out tariffing, although it must be in accordance with agreements of public significance. In regional passenger transport, the railway carries the transport load, assuming the leading position in the overall transport system organization. In this paper, we have performed a comparative analysis of 5 different tariff systems in regional passenger transport, using five countries of the EU. The paper establishes the methods of tariffing, outlines the results of the analysis, and proposes potential solutions for advancing tariff systems.

Keywords: tariff systems ; regional passenger transport ; railway transport ; public transport.

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Use of Alternative Means of Movement in Tactical Tasks of Czech Army Units

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Abstract

At present, the Czech Republic Army is significantly involved in implementing a wide spectrum of operations and tasks, including non-combat operations and assistance activities to support the Czech Republic Governmental institutions. We can mention Police, Fire fighters, Medics and so on. Because the professional part of the Army is widely involved into operations and training system, the non-professional part - Territorial forces is able to fill part of those supportive tasks. Problem is, that Territorial forces do not own such various technic and instruments, as their professional colleagues. The most critical instruments are transport vehicles, combat vehicles, sensors and radios.
The article´s authors present the possibility of using a simple technical solution that can streamline army units´ work and the application with an overlap to other state components. The article aims to discuss and verify using e-bikes as a capable alternative means for implementing armed patrolling units using scientific methods´ practical use. The authors present concrete, unusual results using the knowledge of specific tactical tasks, technical possibilities, and experimental tests. Comparing useful tools, they present optimal solutions with a significant impact on units´ future use. By incorporating internal principles and models, the authors also present calculation standards for planning operations using e-bikes. The authors see problem of transport, mobility and flexibility as crucial part of every action, doesn´t matter, in which resort. The article also supports research organizations´ social significance and reflects new challenges and trends arising from real threats that may be very topical shortly. The article is applicable also for other (non) governmental institutions. The new and simple approach has potential to change many spheres of activities.

Keywords: Capabilities; possibilities; movement; speed; calculation; tactical tasks; observation; protection;

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The investigation of eco-driving possibilities in passenger car used in urban traffic

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Abstract

As commonly known during the operation of technical facilities their properties of operating parameters are changed, this also applies to the vehicle used internal combustion engines. It is connected with the influence of working and external factors on the internal combustion engine. For many years, there has been a discussion on the improvement of the ecological properties of vehicles moving in urban traffic, including technical, legal and solutions related to the technology of vehicle operation and use. This article presents preliminary test results of vehicle in the eco-driving operation in road condition in urban traffic. The results of the impact of chosen parameters like: average speed, time driving, course, type of road, number of stop's, number of braking, was presented. Tests was carried out on passenger car powered by gasoline engine in urban traffic condition travel by so called ”routine route”, of a selected area of the city of Lublin in the south-east Poland.

Keywords: driving style; ecology; fuel consumption; maintenance; technical system; travel time;

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Reducing Emissions from Aviation and Their Impact on Aviation Work in Agriculture

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Abstract

The article deals with the issue of emissions in aviation and their impact on aerial agricultural work. The authors of the article try to prove the impacts and risks of reducing emissions in some areas of transport, where the regulation of the industry causes the cessation of some activities. Efforts to reduce greenhouse gas emissions can have the opposite effect on the desired result. The authors discuss the relationship between reducing the volume of aerial work in agriculture and increasing the volume of work in ground spraying performed by agricultural machinery. The resulting analysis shows an increase in groundwork at the expense of aerial agricultural work. However, this trend is associated with some risks, which are discussed in the article.

Keywords: Aircraft; Air transport; Environmental impact; Carbon Offsetting

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Cost calculation and economic efficiency of carpooling

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Abstract

Reducing the costs and environmental impact of passenger car transport is very important. However, people are often more interested in money savings. Carpooling is a passenger transport system in which the driver shares a seat or seats in his car. The system consists of a certain number of vehicles, users, and a coordination element. It is very different from Carsharing, in which the whole vehicle is shared. It is not easy to quantify the economic benefits of a carpooling system for the driver. The third chapter shows the cost calculation of operating a private passenger car. Currently, drivers can use various booking systems that recommend the optimal price for transporting one person for a specific distance. It is approximately possible to determine what travel fare the driver obtains in the carpooling. These revenues are in the fourth chapter of the article. The main goal is to evaluate the economic efficiency of carpooling by comparison of calculated costs and revenues. It shows the exact methodology of how it is possible to estimate the economic benefits of the carpooling system for individuals.

Keywords: carpooling; car; costs; calculation.

Proposal for a change in the type of devices used for submitting of postal items by using the Saaty´s method, a case study for the postal sector

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Abstract

The first mile as a part of logistics of postal items is beginning to appear as another narrow place in the logistics process that needs to be improved. One of the categories, of this first mile, may also be the collection of items by authorized employees of postal companies from letter boxes. Because universal postal service requires that you choose to collect items from letter boxes every day, even though not every letter box is filled, this may seem like an outdated way. In addition, the number of letters sent has been declining overall in recent years. Therefore, it would be appropriate for postal operators, in such a case, to focus on the selection of both types of consignments through submission devices. The article is focused on defining the strengths and weaknesses of selected devices for the submission of consignments. Furthermore, criteria are set that influence both the customer and the postal company when choosing a mailbox. Subsequently, the criteria are evaluated by using the Saaty´s method and, at the end, the results of the whole analysis are summarized.

Keywords: Saaty's method, postal lockers, submitting of consignments, multi criteria evaluation;

Impacts of Water Transport Development on the Economy and Society

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Abstract

In this study, we analyze the impacts of water transport development on the economy and society in the Slovak Republic. We compare water transport with other modes of transport and analyze the possibilities of using water transport for sectors of the national economy. We will focus primarily on strengthening water transport at the expense of road transport. The main reason is the capacity limit of the road network. The results of the analysis represent an economic estimate of the effects of the relocation of part of the transport flows from road to water transport. The analysis works sensitively with the transfer of part of the load from road transport to water transport, in order to avoid the liquidation of road transport, but to offer an alternative from which road transport can also benefit.

Keywords: water transport, economy, society, transportation costs, transportation performance

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Assessment of market power on the route Prague – Ostrava

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Abstract

The aim of this article is to assess whether České dráhy enjoyed a dominant position between the years 2011 and 2019. The European Commission is currently investigating České dráhy for an alleged abuse of dominant position in the form of predatory prices between the year 2011 and 2019. In order to actually fine České dráhy for this conduct, the European Commission will have conclude that České dráhy actually enjoyed a dominant position. This article suggests that although the market shares of České dráhy indicate an existence of dominance, examination of further factors suggests that České dráhy were in fact not in a dominant position.

Keywords: competition economics, abuse of dominant position, České dráhy, European Commission, competition law

Transfer times improving in railway stations through the economic indicators

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Abstract

The article deals with the issue of continuity of railway connections in a selected railway station on the ŽSR network. There are railway stations where transitions between the two directions are not provided. Passengers must travel more kilometers and pay higher fares to the nearest railway station, where a transfer is possible. This increases travel and increases travel time. Based on the current state of train connections at the selected railway station, the transfer times will be adjusted to suit passengers from / to all directions. This adjustment will be quantified from the point of view of saving passengers' time on selected connections.

Keywords: change trains, regional railway transport, railway station

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Modern technologies development in logistics centers: the case study of Poland

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Abstract

Nowadays, the growing role of logistics centers is observed within supply chains. These centers operate on the competitive market and face growing customers' requirements. Such occurrence forces these centers to implement various technological solutions in order to improve the quality level of their services. The article's aim is to investigate the actual development stage of modern technologies used in logistics centers, as well as identify the benefits and threats related to these technologies' implementation. The case study of logistics centers located in Poland has been considered. The current condition of technological development of logistics centers was analyzed based on questionnaire survey methodology. Based on survey's results, it was stated that domestic logistics centers are constantly evolving; nevertheless, the need for further development is observed.

Keywords: Modern Technologies; Logistics Centre; Marketing Research; Logistics 4.0

The fleet of regional air carriers in Europe commonality analyses in a broader context of business models research

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Abstract

While the tools of business model´s analyses focused on traditional and low-cost carriers are well elaborated by current economic research, regional air carriers stand aside from this research trajectory. This paper is aimed at answering the question whether the fleet commonality analysis is an adequate set-forwarding standard point to analyse business models of regional air carriers. Our analysis, covering 31 European regional air carriers (based on the descriptive data on fleet´s commonality and two variants of Herfindahl-Hirschman Index), reveals the spectrum of obtained results what indicates that there is more than one business model within the group of regional air carriers, and that fleet commonality itself is not an attribute differentiating regional air carriers from low cost carriers and traditional air carriers, nor identifying the business model of regional air carriers. This finding calls for spurring the research focused on further symptomatic features of regional air carriers in a broader context of their operation such as travel and reservation classes, customer´s loyalty programmes, network configuration, cooperation with other air carriers, domestic vs international scope of operation, cooperative arrangements with regional airports and regions within countries, participation in public service operation, and institutional framework of operation. From methodological point of view, the combination of approaches which have been already applied in the research of air carriers´ business models as well as new methodologies will be inevitable to be developed to understand more the business models of regional air carriers.

Keywords: periodical technical inspection station; technical inspection; temporary roadworthiness; non-roadworthiness of vehicles; assessment of technical condition of vehicles; road traffic safety; road transport

A statistical value of a human life in Slovakia

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Abstract

Transport nowadays has a significant meaning for a society and it belongs to the important conditions for the effective functioning of advanced economies. Transport is profitable for the society, brings benefits, such as certain mobility, and saves time. On the other hand, transport causes loss. An increasing number of traffic accidents, which have resulted in the loss of human lives, various injuries and material damages, causes a serious burden to the environment. Negative effects of transport reduce the quality of live and society has lost considerable amount of money. In our contribution we would like to analyze the traffic accident rate in Slovakia and to define the value of a human life from the view of social costs.

Keywords: traffic accident rate, statistical value of human life, accidents losses

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Road pricing adaptation to era of autonomous and shared autonomous vehicles: Perspective of Brazil, Jordan, and Azerbaijan

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Abstract

The advent of autonomous vehicles as a major player in the automotive market in the near future is highly expected because of its benefits in terms of safety features, comfort level, utilization of travel time, energy consumption, traffic throughput and accessibility. However, due to these benefits, number of trips and traveled miles on roads will expectedly increase. Therefore, formulating a traffic regulator policy like road pricing will be essential. Despite its benefits related to reducing congestion and revenue generating, general acceptance of road pricing is considered low. This paper analyzes acceptance of road pricing scheme and adoption of autonomous vehicles in Brazil, Jordan and Azerbaijan through an online survey comprised of a stated preference experiment, questions about various background characteristics and public attitudes and behaviours. Multinomial regression model is used to interpret the responses of participants. The results show that people's acceptance of road pricing and adoption of autonomous vehicles are affected by several individual and environmental factors. The level of road pricing acceptance and autonomous vehicle adoption varies among the investigated countries, but in general, road accidents, pollution, and educational level have the greatest impact on Jordanians, Brazilians and Azerbaijanis, respectively.

Keywords: Road Pricing, Autonomous Vehicles, Shared Autonomous Vehicles, Acceptability, Adoption

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Blockchain technology as a new driver in supply chain

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Abstract

Processes associated with the transformation of inputs (raw materials, components) into outputs (goods, finished products) and their transport to the place of consumption are an essential part of the functioning of today's society. These processes are becoming more complex with the gradual globalization. As the complexity of the supply chain increases, so does the risk of disruption. There are problems such as a lack of information on the origin of the products, a lack of real-time information and, with that, a problem with tracking shipments. With a large number of documents, the risk of fraud and forgery also increases. Due to the large number of stakeholders in logistics chains, the level of transparency is being lost. One possible solution to eliminate the risk of supply chain complexity is to integrate blockchain technology into the supply chain. Thanks to properties such as distribution, immutability, transparency, blockchain can have great potential to solve the problems of the traditional supply chain. The aim of this paper is to describe the basic problems of the traditional supply chain, which can disrupt its course. In the next part, we will introduce the basics of blockchain technology and describe what processes of the traditional supply chain could be replaced by this technology.

Keywords: Supply chain, Blockchain technology, processes, information

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Determining the minimal safety level of automatic road sign recognition system – field study survey

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Abstract

In this paper, the authors investigated human drivers' road sign recognition capability to determine the minimum safety level demanded from artificial intelligence. Therefore, the authors build up a survey and tested drivers to determine the meaning of roadside signs. A small sample was required as a pilot project with 51 respondents. Most of them were male and young. As preliminary result authors have found that the roadside human recognition has been significantly influenced by the age, the year of obtaining the license, and the driver practice.

Keywords: roadside sign; recognition; survey; statistics

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New approach to defining the term Space Traffic Management based on linguistic analysis

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Abstract

This paper deals with a new approach to defining the term Space Traffic management. The method of linguistic analysis of 10 definitions, published by various authors, is used to create new definition of the term. Subsequently, the new definition is proposed, taking into account the most frequently words appearing in previous definitions. This paper explains new definition in detail. The definition has the ambition to be accepted by academic and industrial authorities in the Slovak republic as well as abroad. New definition looks at the term Space Traffic Management from different perspective and it reflects requirements for higher safety standards in space research and exploration.

Keywords: "space traffic management; linguistic analysis; definition"

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Analysis of return logistics in e-commerce companies on the example of the Slovak Republic

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Abstract

The development of technology and globalization has increased the possibilities of e-commerce and allowed further development of world trade. E-commerce has changed the way you do business and the concept of buying. With the growth of e-commerce, traders need to pay significant attention to their companies' critical functionality - logistics-to satisfy customers. With the development of the e-commerce industry, online stores have to face a massive number of problems. One of the most significant is the return of goods and the organization of return logistics. The scale of refund management on a global scale is enormous.
The article analyzes the current stage of return logistics in the world of e-commerce. We also surveyed companies that sell via the Internet in Slovakia. Based on the responses, global statistical indicators' return logistics are compared with the Slovak e-commerce market.

Keywords: e-commerce, reverse logistics, return logistics, online shopping, goods returns, return management

The relationship between economic growth and logistics sector in the case of G-7 countries

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Abstract

This paper aims to research the logistics sector-government consumption-growth nexus in the case of seven largest advanced economies at the global level (G7). The data at the annual level are collected in the period between 1971 and 2016. The methodology employs the panel data econometrics (panel VAR model). The economic growth (GDP) is found to respond positively to the both, logistics sector (AIR) and government consumption (CON) in the bivariate panel VAR models. The Granger causality test reports a bidirectional link between GDP and AIR and unidirectional causal link running from CON to GDP. A trivariate panel VAR model provides the supportive evidence to the positive logistics sector-government consumption-growth nexus. With regards to the causal relationship, Granger causality test implies a bidirectional causal relationship between all variables of interest suggesting that economic growth can be the consequence of the logistics sector development and government consumption but can also stimulate these two sectors. Even more appealing is the fact that logistics sector is approximated using the air freight implying the tendency of G7 countries to use faster and more efficient matter of transport. Thus, the most important policy implication advocates the need for stimulating the development of logistics sector especially the one based on renewable energy in the seven largest advanced economies since it tends to significantly contribute the economic development.

Keywords: economic growth; logistics sector; panel VAR; government consumption;

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Verification of train-set deployment on the long-distance line R16 Praha – Beroun – Plzeň – Klatovy in connection with IPT principles

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Abstract

This article deals with an example of a long-distance railway line from the Czech Republic and solves the technological verification of the change in the operational concept of the long-distance railway line R16 Praha – Beroun – Plzeň – Klatovy (– Železná Ruda-Alžbětín), specifically is focused on the possibility of reaching junction Beroun as IPT-node at minute 00 by this line. At first, the article searches in the field of railway transport technology and analyses the operational concept of R16 line, related regional transport lines and the conceptual goals of public transport purchasers in the researched area. Subsequently, the problems of the current operational concept are formulated, and the goals and reasons for verifying the modification of the operational concept of R16 line are determined. Then, as a main goal, the possibilities of modifying the operational concept on the side of deployed railway vehicles are examined. There are tested and subsequently evaluated various variants of deployed train sets on R16 line and then the most suitable variant is recommended.

Keywords: Railway passenger transport ; Timetabling ; Train paths ; Timetable stability ; Integrated periodic timetable ; System travel time

Influence of innovative elements of railway infrastructure complex on the technology of the transport process

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Abstract

The transport industry in the modern period faces the challenges of digitalization, infrastructure modernization, and intensification of the use of existing lines. To carry out the transportation process, the railways of Russia are equipped with various technical devices and means, which include various devices of railway automation. Simultaneously with the development of new control systems, the introduction of new technologies of operational work is taking place. The paper considers the feasibility and efficiency of using mobile block sections and virtual couplings in conditions of limited capacity of railway directions, allowing to optimize the interval regulation of train traffic, reduce train intervals, reduce power consumption for traction, as well as infrastructure maintenance costs. The economic and technological aspects of the implementation of these innovations are revealed.

Keywords: infrastructure, innovations, railway transport, auto-blocking systems, technologies, throughput, indicators, efficiency

Analysis of marketing efficiency on the example of Faraday future (Manufacturer of electronic machines)

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Abstract

Currently, in conditions of competition, high information load, the emergence of new consumer segments, differentiation of consumer requirements, the importance of identifying and forming competitive advantages that will provide a company with better market positioning, increased profits and customer loyalty increases. In a period of tougher market competition, the main task of companies is to create competitive goods or services; this corresponds to the modern provisions of the marketing concept. In this regard, modern companies have an increasing need to apply marketing tools for sustainable market behaviour and business efficiency. The purpose of this article is to analyse the current marketing activities of the company and develop proposals for the development of a real marketing model, taking into account the requirements of the modern market. The research target was Faraday Future, a growing electric vehicle company. This article explores the financial activities of Faraday Future, analyses the media activity of Lucid, Tesla, Faraday, presents an analysis of marketing results, presents the calculation of the coefficient of variation of sales for Faraday Future products, analyses the organizational structure of the marketing department, and proposes solutions to improve certain areas of marketing activities companies.

Keywords: electric vehicles, marketing, marketing activities, calculation of the effectiveness

Company product policy for the production and sales of electric vehicles

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Abstract

Product policy is the core of marketing decisions, around which other decisions are formed related to the conditions for the acquisition of goods and methods of its promotion from the manufacturer to the end consumer. The article discusses the main areas of analysis that precede the formation of the company's product policy using the example of Faraday Future.

Keywords: electric vehicles, product policy, marketing, pricing, assortment, sales structure, sales structure analysis.

Update criteria for selecting service providers for railway transportation enterprises

Vakulenko S.P.[a], Belozerov V.L.[b], Kurenkov P.V.[1], Chebotareva E.A.[c], Solop I.A.[d], Kuzina E.L.[e], Vasilenko M.A.[f], Astafiev A.V.[g], Zyurina O.A.[h], Zmeškal E.A.[i]

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Abstract

The article discusses the need to clarify the criteria for choosing service providers for JSC Russian Railways to increase the economic efficiency of activities, productivity and determine the adequate cost of the services provided, as well as the need to use foresight technologies in combination with outsourcing, insourcing, crowdsourcing, outstaffing, staffleasing and others. tools for achieving strategic goals and priorities for the further progressive development of railway transport.

Keywords: Outsourcing, insourcing, crowdsourcing, outstaffing, staffleasing, innovation, productivity, efficiency, service, foresight

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Understanding the public rail quality of service towards commuters' loyalty behavior in Greater Kuala Lumpur

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Abstract

Sustainability in urban transport mechanisms is a matter of significance in developing economies. Assessing the commuters' behavior towards urban transport system facilitates the authorities to devise the policies for the safe and advanced choice of mobility. In the Klang Valley of Malaysia, the personal mobility practices have created the challenges of overcrowding the urban roads with automobile cars which resulted in economic, environmental, and infrastructure losses. The public rail transit system is deemed as the preferable choice of solution. To understand the perception of rail transit service attributes from commuters' viewpoint, a quantitative study was conducted by accumulating Service Quality (SQ) of rail network towards Behavioural Intention or Loyalty (BI) of commuter to use the public transport. Satisfaction (SAT) was added as mediation between SQ and BI. An online survey was conducted that resulted in 141 commuters' responses. The data were analyzed through Structural Equation Modelling (SEM) and it was found that SQ has a positive and significant impact on SAT and BI. The partial mediation was developed from the path analysis of the trio. The study strengthened the vitality of service quality features for enhancing the loyalty of denizens towards public transport mechanism. The research provided the attributes of transport services to focus on more for commuter integration.

Keywords: Urban Mobility; Service Quality, Satisfaction,

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Options for assessing the impact of the bike-sharing system on mobility in the city Žilina

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Abstract

Urban transport is a problem that affects the whole of society. Cities are aware of the unsustainability of the current situation and are trying to address it. Therefore, measures have been introduced in recent years that should contribute to the sustainable development of urban transport. One of the alternative modes of transport, which is becoming more and more popular, is the bike-sharing system.The aim of this paper is to point out the results of analyzes of the functioning of the shared bicycle system in the city of Žilina (Slovakia). The bike-sharing system in this city has been operating since March 2019. The article also presents an analysis of the availability of individual participants. It should be noted that the bicycle sharing system is very popular among the user system and that it is used by more people. Therefore, the city should be equipped with a dense network of conveniently located bicycle sharing stations. The quality of the bike-sharing system should match the user's expectations.
The paper presents the results of analyzes of factors influencing the use of the bicycle sharing system. The results obtained may be useful in carrying out activities that are more effective in using a bicycle sharing system as well as in increasing the level of satisfaction with the use of a bicycle sharing system.

Keywords: bike-sharing system, transport, bicycle, city of Žilina, mobilty;

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Impact of Police Enforcement on Critical Gap at Roundabouts

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Abstract

At modern roundabouts, entering vehicles must yield right of way to vehicles in the circulating lane and can only proceed if there is a proper gap. The critical gap is the minimum acceptable gap that a driver will use to enter the roundabout. It is thus assumed that drivers will reject gaps of a value less than it and will accept gaps of a value more than it. In some countries, due to heavy congestion, police enforcement officers monitor and regulate the movement of vehicles at critical roundabouts during the peak hours of the day as needed. In some cases, police enforcement officers will be present at the roundabout during peak hours without interfering with the traffic flow to reduce the incidence of traffic violations. The purpose of this study was to investigate if there is a change in driver behavior in the form of a change in the critical gap value. A major roundabout was used to investigate the effect of police enforcement presence. The results of the study indicated that the critical gap during the police enforcement presence was 2.13 s whereas the critical gap of the roundabout during normal conditions was 2.42 s. The reduction in the critical gap is an indication that roundabouts can perform better and handle more traffic volume when police officers are present.

Keywords: gap acceptance; human factors; drive behavior; roundabout performance; multi-lane roundabouts

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Public Transportation Usage in a Hot Climate Developing Country

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Abstract

Qatar is one of the most car-dependent countries in the Middle East, and fewer people use public transportation. The purpose of this study was to investigate the public bus ridership in the country during the period from 2012 to 2016. The relationship between the ridership and population, number of public bus lines, day of the week, and weather conditions were studied. The study revealed no clear relationship between the ridership and the population or the number of bus lines. In some cases, the ridership decreased with the increase of the population and number of lines and vice versa. The public bus ridership increased during the weekends compared to the weekdays. The results also indicated that the ridership greatly decreased during the hot weather of the summer season and increased during the winter season when the weather is pleasant in Qatar.

Keywords: bus service; travel mode choice; public transit; urban transportation; developing countries

Development of The Non-Taxable Part for Taxpayer in Slovakia

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Abstract

The Government of the Slovak Republic has agreed to increase the non-taxable part for the taxpayer's tax from 2020. The proposal for this increasing was accompanied by significant protests by local municipalities, which feared a shortfall in their budget. It is true that gross domestic product in the Slovak Republic has a growing trend, but is the growth of non-taxable parts in accordance with the growth of other macroeconomic indicators? The article deals with the analysis of the trends of year-on-year growth of decisive macroeconomic variables and on the basis of the analysis of these trends we have determined the optimal values of development in the coming years.

Keywords: Non-taxable part; tax base; taxpayer; average wage; gross domestic product

Diagnostic and repair centers locating methodology for vehicles carrying sensitive cargo

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Abstract

In recent years, an increase in the demand for the transport of sensitive cargo has been observed. These loads need to maintain the special conditions during transport, that influences the transport companies decisions to equip their fleet with specialized transport means. The growth in the number of these vehicles increases the demand for dedicated diagnostic and repair services. Therefore, a concept was proposed to create a network of diagnostic and repair centers for vehicles carrying sensitive cargo along with a methodology for determining their locations. The developed methodology pays special attention to the operational reliability of transport means within particular roads sections. A case study was considered and selected route in Poland was analyzed in detail. Additionally, the number of accidents and collisions that occurred within the selected route between 2015 and 2018 was studied. On the basis of the obtained data, applying the proposed methodology, the locations of diagnostic and repair services were determined for the route, as well as illustrative extension of the developed concept was conducted for Poland. The proposed concept of diagnostic and repair centers network in Poland includes thirteen locations and intends to reduce the risk of failure to perform the transport task, which may contribute to increasing the profits of transport companies and reducing the negative impact of road transport on the environment.

Keywords: sensitive cargo; road transport; diagnostic and repair center; rest and service area; operational reliability

Impact of COVID-19 on bus and urban public transport in SR

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Abstract

The global health crisis, to the extent we are experiencing, has not affected the international community for more than a century. The epidemiological situation in recent months has severely affected all spheres of life and the economy, and has also significantly affected bus transport. Irregular bus tour transport was affected most by the measures taken and a number of carriers have no transport performance. The paper examines the results of the impact of the adopted preventive measures against the spread of COVID-19 on suburban bus transport and urban public transport. Due to the lack of overall data for 2020, a statistical survey was carried out on a sample of selected bus operators, examining the development of the number of passengers carried, the number of kilometers traveled during the first six months of 2020 compared to 2019. The adopted anti-epidemic measures have impacts on the costs of carriers and the outflow of passengers to passenger cars, respectively. to other types of mobility e.g. bicycle transport. This means increasing demands on the financing of bus transport by customers of public passenger transport.

Keywords: bus transport, carrier, COVID-19, measures, crisis, mobility;

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Possibilities of increasing the throughput of ports

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Abstract

The aim of this paper is to point out the importance of port throughput in terms of fulfilling its basic tasks related to loading/unloading of cargo. Maritime and inland ports are a significant component of the efficient functioning of many countries' economies. Their basic activity is mainly focused on loading/unloading of cargo in various variants of work. The total amount of cargo transferred during the navigation period is expressed as port capacity. Navigation period represents the number of days. During these days it is possible to transport cargo on the waterway by vessels. Increasing the throughput is important, especially in terms of the port's revenue and the discharge of its financial budget. Knowledge how to increase the throughput allows to make a full use of the potential of the port and to propose its possibilities for its development. By pointing to the individual components of throughput and their impact on the efficient functioning of ports, it forms the basis for the creation of effective components. And these components are key factor in the development of loading/unloading activities and ultimately the port itself. So, the results of this paper are focused on better using of port facilities and port operations.

Keywords: loading, unloading, port capacity, technology

Measuring the impact of digital technologies on transport industry – macroeconomic perspective

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Abstract

Digital technologies, digitization, digitalization, digital transformation buzzwords and phenomenon of today. A question arises in connection with these catchy terms. What are the consequences of the penetration of digital technologies into business processes? Measurements of these consequences can be oriented micro-economically and macro-economically. The aim of this article is to focus on the macroeconomic perspective. Emphasis is placed on a selected industry of the national economy, which is the transport industry of Slovakia. The research results are an estimate of how digital technologies affect the transport industry. The conclusions of the research can serve as a basis for the formulation of transport policies that are a part of a strategy of digital transformation of the transport industry.

Keywords: Digital technologies, Digital transformation, Transport sector, Technological progress

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Modeling of time availability of intermodal terminals

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Abstract

The optimal localization of intermodal terminal is very important issue from the viewpoint its future use. The location of the assessed, actual public intermodal terminal is considered based on this main criterion. On the other hand, when approving the construction of a public terminal in Žilina, supported with European Union funds, it was assumed that the motorway network would be completed in its vicinity. The paper presents the results of research which aim was to examine the impact of unfinished superior transport infrastructure of two intermodal terminals in the Žilina self-governing region, considering the time of their availability. The transport modeling tools were used in the research on the transport network of the Žilina region within the developed multimodal transport model. The paper presents research published for 2018 and for the prospective of 2048, when all the superior infrastructure should have been built.

Keywords: intermodal transport; transport modeling; time availability

Innovations in the process of transporting the disabled

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Abstract

The article deals with the issue of transport of people with disabilities, specifically by rail. It analyzes the representation of these people from a demographic point of view. From the point of view of transport technology, the subject of research is the inclusion of a specialized car for the passengers with reduced mobility in train sets. With the help of a questionnaire survey, it focuses on shortcomings subjectively perceived by passengers. These data are the basis for the proposal, which is then evaluated financially.

Keywords: rail transport, passengers with reduced mobility, quality

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Comparison of fuel consumption of a passenger car depending on the driving style of the driver

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Abstract

The driver, with his driving technique, can significantly influence the vehicle's consumption and thus also the production of emissions. The aim of the research is to find out how driving technology affects fuel consumption. The comparison of the impact of the driving technique will be performed on the basis of driving tests performed on a selected section of the road for different driving techniques. The main part of the research is a practical measurement on the basis of which we were able to evaluate individual driving styles and evaluate their impact on fuel consumption and vehicle operation. The data obtained are fully applicable to common practice. Measurement-based conclusions and recommendations can provide useful information to any driver. As the practical part of the research was carried out on a personal vehicle, the final recommendations and observations are also intended for this group. Due to driving technology, the driver is able to influence more data than just the vehicle's consumption.

Keywords: vehicle, driver, fuel consumption, driving style;

RFID technology and its effects on improving technological processes at the Čierna nad Tisou station

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Abstract

We can no longer imagine life without modern technologies. In many ways, they facilitate human labour, provide distraction or information. In the context of a modern dynamic age, technology is helping us speed up our work. In the transport sector, this is appreciated especially by customers to whom goods can be delivered faster. RFID technology is just such a technology. The main aim of the paper is to optimize working procedures at a specific railway station while using this technology in order to prove its efficiency in the field of speeding up transport. Streamlining processes is the key to reducing disruption and downtimes during transport. At the same time, in this way it is possible to increase the competitiveness of rail freight transport on the transport market and thus ensure better distribution of transport.

Keywords: RFID technology, rail freight transport, optimization of operational processes

Concept of Investment Plan for the Production of Rubber-Based Noise Reduction Panels

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Abstract

The circular economy is based on the principle of using waste raw materials into new products in order to protect and create a healthy environment. The used tires are a commodity for which there is great potential for applying the principles of the circular economy. This paper presents an economic evaluation of the concept of the investment plan to expand the operational capacities for the production of the rubber-based noise reduction panels, including the definition of the critical level of capacity. The following evaluation methods were used: Net Present Value, Profitability Index, Internal Rate of Return and Payback Period, which confirm the effectiveness of this investment.

Keywords: circular economy, recycling, tires, rubber, noise reduction panel

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Ensuring the logistics of the last mile from the perspective of distribution companies

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Abstract

In recent years, last mile logistics has been a serious issue, mainly because customers expect fast and reliable delivery of their order, no matter where they buy it or order it. Distribution companies are forced to develop innovative solutions for the delivery of goods to customers to meet their needs and meet their requirements. In the world, drones or autonomous vehicles, for example, are already used to deliver certain types of goods within the last mile, but in most cases traditional methods such as postal and courier services are used to deliver goods. The aim of the article is to state the possibilities of delivery of goods to customers, which are currently offered by distribution companies in Slovakia. For this purpose, the individual methods of delivery of goods, which are offered to customers by distribution companies and e-shops, were compared, evaluated in terms of their positive and negative aspects. Subsequently, the methods of delivery of goods in relation to the type of goods and customer requirements were investigated. The most frequently offered ways of delivering goods to customers are delivery of goods to a stone shop or a post office. On the other hand, the least offered option is the delivery of goods to an external dispensing point.

Keywords: transport; postal services; courier services; e-shop; last mile

TOPIC 2: Mechanical Engineering in Transport

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Authors are responsible for language and content of their abstracts.

Influence of the surface roughness of the C55 steel on its tribological properties after application of the WC / C coating

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Abstract

Influence of the surface roughness (rough grinding, grinding, polishing) of stainless steel C55 on its tribological properties, after application of the WC/C coating, is experimentally verified in this paper. Results of the tribological tests, taking into account the complexity of the surface preparation, proved that the most suitable way is applying the WC/C coating onto the ground surface of carbon steel C55.

Keywords: carbon steel C55, WC/C coating, roughness, tribology

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Optimization of four stroke spark ignition engine for firesport

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Abstract

The effort of engineers is to achieve the highest possible power from the engine of a given size, in other words, to improve the weight - power ratio. This must be achieved while maintaining other parameters such as service life, emissions, fuel consumption, and others. Engine power is (simply put) given by the amount of air supplied to the combustion process. From this point of view, there are two ways to increase engine power: engine overcharging or improving the hydraulic conditions of the intake and exhaust system. This paper describes the second way - modifications of the four-stroke spark-ignition engine, which lead to engine power increase. Outputs using laboratory measurements have been verified. In addition, an engine model in Lotus Engine Simulation software has been created. The paper deals with the effect of some engine adjustments on the power: modification of valve shapes, modification of intake and exhaust ports, and camshaft modification. The described engine is mainly used in firesport, which is one of the most popular sport disciplines in the Czech Republic and in Slovakia. All adjustments are designed so that the modified engine meets the rules for firesport. Due to the fact that the assessed engine for sports industry has been used, neither fuel consumption nor emissions have been monitored.

Keywords: Engine modifications; engine power; volumetric efficiency; flow coefficient; engine simulation;

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Methodology of design and optimization of internal logistics in the concept of Industry 4.0

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Abstract

The current development of logistics says that only the fastest, cheapest, and most efficient in terms of productivity wins. The role of the designer of the logistics system is already in the design phase to incorporate flexibility into its properties as well as the ability to react quickly to constantly changing conditions. With the advent of digital technologies and digital factory tools, it is possible to design a logistics system in a digital environment or create an exact virtual copy of an existing system. Through parametric models and modern planning tools, it is possible to ensure an almost immediate response to any change. The article is devoted to the methodology of planning and optimization of internal transportation using Industry 4.0 tools.

Keywords: internal transportation; parametric model; logistics system.

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Modern Possibilities of Patient Transport Aids

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Abstract

The article describes the types of existing handling aids for transport patient and analyzes those that are used in Slovakia. There are different types of patient transportation – manual handling, non-mechanical aids, mechanical aids Every type of manipulation uses a different type of handling aids. There is selected ward for making analysis about the most loaded activities in the work of nurses. Using of handling aids is also analyzed. Today's technical equipment allow their use in the field of healthcare. That should simplify the work of healthcare professionals and improve ergonomic conditions.

Keywords: manipulation; handling aids; nurse, patient

Microstructure and fatigue performace of additively manufactured AlSi10Mg.

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Abstract

Laser powder bed fusion technology (L-PBF) can readily fabricate near-net shape metal parts. Therefore, the automotive and aerospace industries have been investigating the L-PBF production of AlSi10Mg parts because of low specific density, good hardenability, and low powder costs. Further, local melting of the atomized powder and subsequent rapid solidification generates fine structures having mechanical properties that are competitive with conventionally produced Al alloys.
If the products remain in the as-built state (i.e., no post fabrication heat treatment), residual stresses are expected in the part and are superimposed on the operating stress with often unpredictable effects on its fatigue life. As-built part surfaces are rough compared to machined surfaces with a negative influence on the fatigue strength of L-PBF AlSi10Mg parts. On the other hand, surface machining is not only expensive but often impossible for L-PBF parts due to their geometric complexity.
This study investigates the fatigue behavior of L-PBF AlSi10Mg under the combined effect of untreated condition and as-built (i.e., rough) surface quality. Three sets of miniature specimens, each with a different orientation (A, B, C) with respect to the build direction were printed in an SLM 280 HL system operating with a layer thickness of 50 μm. Each set consisted of approx. 15 samples. The as-built samples were tested in cyclic plane bending at a load ratio R = 0 at a frequency of 25 Hz and a significant directional influence on the fatigue behavior quantified. To investigate the origin of this behavior, samples for each orientation were examined using metallographic techniques to determine the structure and quality of surfaces. Surface features depending on printing strategy and printing parameters of the different specimens qualitatively explain the observed directional fatigue behavior.

Keywords: Additive manufacturing; Powder bed fusion; AlSi10Mg; Microstructure, Surface roughness; Fatigue

Transport of phytomass in combustion process from plant to small combustion plant

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Abstract

Harvesting, transportation, storage and subsequent transport of phytomass to the combustion chamber directly and indirectly affects the combustion process itself. An important parameter that can also be affected by the method of transport is the melting temperature of the ash. Its reduction has an impact on the problematic combustion and formation of sintered formations. When using this type of fuel for combustion, it is necessary to know the aspects affecting combustion in a comprehensive way. Knowledge of the influence of fuel transport on the combustion process can be used for subsequent prediction of the required quantities. Regression analysis is one of the tools of mathematical modeling, which allows you to create a prediction model from a set of measured data. For this purpose, a regression model was created examining the power and emission parameters (Particulate matter – PM, CO, NOx) of a small heat source for burning straw pellets using different settings of the feeding and waiting times of the conveyor system. The highest performance in the combustion plant was achieved with the shortest waiting time and the longest fuel supply time. With this setting, the production of CO and PM emissions was also the highest. The created mathematical models dealing with the production of emissions, depending on the setting of the conveyor, showed a high deviation of RMSE, due to the low number of measurements and high variability of measured values. For prediction purposes, it is possible to use created models aimed at determining the performance and efficiency of the combustion plant, where the deviation of RMSE predicted data from the measured was less than 2. Using regression analysis tools can create similar types of models where other combustion parameters will be investigated or a complex mathematical model will be created containing a larger number of input dependent parameters.

Keywords: fuel transport; low melting point, combustion process, alternative fuels, mathematical model

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Examination of fatigue life of HSLA Domex 700 MC welded joints

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Abstract

Manufacturing of steel which meets the conditions of a high-strength low alloy (HSLA) steel, requires three key criteria: low carbon content, microalloying and thermomechanical treatment. Mechanical properties of HSLA steels have shown higher yield strength and toughness as well as good weldability and formability without long-standing loss of these superior mechanical characteristics. Few researchers have already addressed the main problem of HSLA steels which is decreasing their mechanical properties during welding. Most studies have only focused on mechanical properties during welding processes, but it is also very important to test the fatigue behaviour of those steels in the heat-affected zone (HAZ) on welded joints. The present paper discusses the fatigue life of gas metal arc welded (GMAW) joints of HSLA steel Domex 700 MC comparing to the fatigue properties of as-received material. Rotating bending fatigue tests were used for analysis of fatigue life and showed a reduction of the fatigue limit on welded specimens.

Keywords: HSLA steels; Domex 700 MC; fatigue; welded joints; gas metal arc welding (GMAW)

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Influence of the location of exhaust diffusers on the transport of air particles in the operating room

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Abstract

The following article deals with the transport of air particles with a size of 0.5 μm in a clean room environment, specifically the operating room. An important factor in determining the degree of cleanliness of the considered space is the concentration of air particles of a certain size in a reserved space called the clean zone. In this article we deal with the transport and concentration of these particles in the clean zone, above the operating table, and their change due to the effect of different volume flow through the drainage distribution elements. The concentration rate and particle motion are simulated using ANSYS software.

Keywords: clean room, operating room, particles transport

Analysis of welding of the rear bridge semi-housing assembly of a firefighter truck by the semi-automatic procedure in gas protection

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Abstract

The problem considered in this paper is the welding technology of the steel assembly of a firefighter truck rear bridge semi-housing. Since in this procedure the welding is done of the two dissimilar steels, it is necessary to analyze effects of welding on mechanical properties and microstructure of individual joint's zones. The weldability of the base metal was considered first (semi-housing tube and flange), then the welding method and the filler metal were selected and, finally, the technological parameters of welding were calculated. The computational and experimental methods were used for the base metal weldability estimate, based on the hardness measurements in the joint's critical zones and analysis of their structures. Experimental investigations performed were aimed for verification and/or eventual correction of the proposed welding technology.

Keywords: firefighter truck, rear bridge semi-housing, welding, weldability.

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Optimalisation of Internal Logistics Transport Time Through Warehouse Management: Case Study

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Abstract

Warehouse management and internal logistics planning and control are growing in importance. Nowadays, many methods have been developed in the areas of warehouse management and internal logistics planning and control. Internal logistics is essential in creating value and maximising profits by streamlining internal logistics tasks. As a key indicator of logistic processes, efficiently is set transport time. The article deals with the possibilities of improving logistics and warehousing using available methods with the smallest possible input capital and decreasing transport time. In the first part, the warehouse is reorganised, and lean methods such as Kanban and Milk run are set. The presented design is applied to the newly created hall. The result is improved processes and shorter transport times for material at the workplace and, ultimately, faster delivery of the finished product to the market and customer satisfaction. Scientific and more important for this study professional benefits consist in the application of mentioned methods. Benefits as a save the costs for the process and more straightforward adjust to external influences.

Keywords: advanced industrial engineering; internal logistics; transport; warehouse; Milk run; Kanban

Cloud platform for learning factories

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Abstract

In recent years, learning factories have expanded, especially in Europe. And they have acquired many forms of equipment that vary in size, scope, function and sophistication and aim to improve the learning experience of students and industry participants in multiple areas of manufacturing and transportation engineering knowledge. This article provides an overview of the concept of a learning factory involving manufacturing and transportation that uses Cloud platforms. To begin with, cyber physical systems need to be illuminated as a technology that connects physical objects with the virtual world. Cloud platforms provide promising prospects for future collaboration between universities. The described architecture allows the simulation of a learning factory. The explosion of the collected data requires a high concentration on the calculation in the Cloud.

Keywords: Learning factory; Transport logistics; Cyber Physical Systems; Cloud; Cloud computing; Industry 4.0;

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Influence of machine tool vibrations on geometric specifications of balls

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Abstract

Increasing requirements for product quality are reflected in the requirements for efficiency and productivity of the production process. Progressive diagnostic methods such as vibrodiagnostics are one of the main fields in the analysis and use of predominantly rotating machines in the production process. It is impossible to manufacture machinery so that it is not accompanied by vibrations during its operation. Therefore, it is very important to monitor and record these values. The vibration values indicate the technical and operating condition of the machine. The present article deals with the continuous formation of the corrugation profile on the surface of test specimens during their production, which are the result of overall vibrating machines and the evaluation of the influence of vibrations on the shape of balls during the manufacturing process. The resulting profile and shape of the balls has a significant impact on their functionality and durability.

Keywords: vibrations, geometric specification, grinding

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Mapping of errors the geometric specification of the machining center

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Abstract

Variability in the product manufacturing process is unavoidable, we can only minimize its impact on acceptable value. In the engineering industry, high demands are placed on the dimensional and geometric accuracy of products. These metrological characteristics are influenced by many factors e.g.: choice of suitable production technology, machine tool, used cutting tool, environment, and others. The greatest influence on the geometric shape of the product is the machine tool itself (errors of the kinematics, its own construction, and components of the machining centre). The submitted article deals with the application of a direct and indirect method for detecting defects of the machine tool. It points to the fact that it is necessary to check the characteristics of the machine by both methods. When applying the indirect method, errors are manifested, which are squeezed into the actual surface of the product under certain production conditions. We may use this information to track the trend of machine tool errors.

Keywords: machining centre; unbalance; geometric deviation; roundness; machine stiffness; Ballbar

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Creating 3D models of transportation vehicles using photogrammetry

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Abstract

Nowadays, digitalization is becoming a common practice. Companies are striving to replicate every necessary process in digital form. This allows them to simulate every designed optimization before its real-life implementation, significantly reducing potential cost. To do so, it is necessary to convert every involved object into its digital form (model). There are numerous ways to create 3D models. These require a certain level of knowledge and additional hardware or software. The main goal is to keep the cost and time consumption to a minimum. This article deals with photogrammetry as a potential way of creating 3D models in the field of transportation. The main objective was to test if photogrammetry can create 3D models of the transportation vehicles and units that are suitable for the design and simulation of transportation processes and other industrial engineering methods.

Keywords: Photogrammetry; 3D model; 3D reconstruction; transportation; Meshroom.

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Utilization of heat transfer through phase change in devices to increase thermal efficiency

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Abstract

The article is focused on the use of waste heat by means of a heat pipe in devices producing waste heat, which can be further utilized. Waste heat transfer is ensured through the heat pipe. The evaporator removes excess heat and is transported through a steam pipe to the condenser, where it is further used as needed.

Keywords: loop heat pipe, heat transport, heat efficiency

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Influence of Retained austenite on Dimensional Characteristics of Bearings Components

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Abstract

Rolling bearings are key components. It is essential that the bearings are highly durable and reliable in order to ultimately contribute to the continuous operation of the machinery. Bearings are required to have a high service life regardless of the conditions to which they are exposed. The presented work is focused on the heat treatment of bearing rings and their investigation in terms of retained austenite and its influence on the geometric characteristics of bearing components. In order for bearings to be more reliable and more resistant to damage, their microstructure must be adapted to the conditions of use in the area. Decay of retained austenite, heat treatment, these factors affect the integrity of the surface, which is also the main goal of this research. The present article deals with the influence of retained austenite on the dimensional stability of bearing rings with 100Cr6 material, surface microgeometry, which have been exposed to different temperature changes (-40 ° C and 150 ° C) over a period of time. The information obtained from the experiments will help to increase the reliability of bearings that can be exposed to various extreme conditions during their service life.

Keywords: bearing steel; residual austenite; dimensional characteristics

Identification of process Prime A turning when machining steel C56E2 and monitoring of cutting forces

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Abstract

Today's modern age, which offers a number of modern and innovative technologies, places more emphasis on increasing productivity. These technologies include a turning method called Prime A Turning. This technology is relatively new and requires examining the impact of cutting forces on the machining process. Monitoring the course of the emerging components of the cutting force identifies the turning process and the creation of dynamic and static phenomena acting on the system of machine, tool, jig and workpiece. The result of the experimental results is identified the effects of force effects when changing the cutting parameters based on the prediction of the cutting process.

Keywords: Machining, Prime A turning, cutting forces, steel C56E2

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Design of an automated line for pressing cylindrical bushings with screws

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Abstract

In the automotive industry, automated production and assembly lines are now used for the production of individual components. In particular, specialized single-purpose machines can incredibly shorten production or assembly time.
This article deals with the design of a single-purpose device that is used for automated assembly of a roller bush with a screw. This assembly is subsequently used in the automotive heavy industry, resp. in agricultural and construction machinery.

Keywords: pressing; roller sleeve; mounting device; screw

Engineering design of lifting device weighing up to 3.5 tons

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Abstract

The paper deals with the engineering design of lifting device weighing up to 3.5 tons. The first part is devoted to market research and the use of lifting equipment. Variant with a scissor construction and a hydraulic drive is chosen. The design itself follows. The machine composes five main parts: the lower frame, the scissor structure, the ramp, the mechanical lock and the drive mechanism. The individual chapters are devoted to design and analysis of these components.

Keywords: engineering design; scissor cocnstruction; hydraulic drive

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Electric and plug-in hybrid vehicles and their infrastructure in a particular European region

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Abstract

As vehicles powered by conventional combustion engines must be refueled with fossil fuels, so electric vehicles need to supply their own source of energy needed to power them. In case of electric vehicles, electric energy is the main commodity, which is stored in batteries. Electric energy for electric vehicle (or some kinds of hybrid vehicles) is most often supplied by home electric charging station or public charging station. If we want to discuss advantages of operation of electric vehicles, we have to analyze the way of production of electric energy. If the vast majority of electricity produced in less ecological ways, which burden and pollute the environment, electric vehicles cannot be claimed as an environmentally friendly alternative and a substitute for internal combustion vehicles. There are also issues with charging options, building infrastructure, recycling used batteries and many others factors effecting future modes of transport. The article analyses the current overview of possibilities of charging electric or plug-in hybrid vehicles, current infrastructure aimed mainly on region of Central and Eastern.

Keywords: electric vehicles; plug-in hybrid vehicle; charging stations; infrastructure

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Application of technical diagnostics in the maintenance of the internal combustion engine of diesel multiple units 812 series.

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Abstract

The aim of the work was to characterize the maintenance of internal combustion engines of diesel multiple units of the 812 series, to process an overview of operational failures, to define methods and procedures for the identification of their actual technical condition. The first chapters are a summary of the prescribed procedures and methods for maintenance from the production of DMU 812 series to the present. The next part is focused on the description of the connection of diagnostic and control sensors in individual cable harnesses. At the end of the work is a proposal of the procedure for diagnosing combustion engine failures. To facilitate the work, a list of codes of individual faults was created with their translation into Slovak. Another tool that this work is the description and connection of individual sensor connectors on the engine in the EDC M(S) 5 cable harness.

Keywords: diagnostics; maintenance; MAN-cats; MIREL 812; EDC;

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Effect of Nozzle Performance on the Ducted Propeller: A Benchmark-Simulation Study using OpenFOAM

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Abstract

As the modernization of marine transportation, it should be needed the strategy to improve the marine vehicle performances. The propeller is one of the important parts which has a function as an actuator during the operation of marine transportation or vehicle. The propeller design and optimization are packages to gain the best performances, included for the ducted propeller. Since the Nozzle design is one of the crucial aspects that influences the efficiency of the propeller. In the present study, the nozzle design has been proposed by using moving the propeller location based on the percentage of duct length. The propeller and nozzle were modelled in Computer-Aided Design (CAD) program packages and was testing to predict the performance using the OpenFOAM computational fluid dynamics (CFD) with Reynold-Average Navier-Stokes (RANS) method. A Kaplan type propeller is selected with 19A duct. The ducted propeller is analyzed by the Moving Rotating Frame (MRF). The computational results are validated by comparing with the experimental value of J from 0.2 to 0.8. The reasonable results were produced such the thrust, torque and efficiency trends were in good agreement with experimental data. According to the analysis, it can be concluded that by increasing 3% the duct length of the thrust increases about 2.148%

Keywords: Ducted propeller, CFD, RANS, MRF, OpenFOAM

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Failure of Friction Brake Components against Rapid Braking Process: A Review on Potential Challenges and Developments

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Abstract

The braking system is a vital component for high-speed vehicles. A better braking system will improve safety while driving. In general, the braking system used a friction principle. The friction appears between the disk pad and disk rotor. The friction on the disk pad and disk will cause damage on the surface of the braking components. The use of a friction-based braking system requires regular maintenance. The treatment is used to maintain the performance of brake components. In general, the brakes wear on the rapid braking process. The friction will affect heat generation, heat generated will be released to the environment. But, in a rapid braking process, the heat dissipation capability will decrease. The overheating disk will increase the risk of disk damage. The damage is caused by the braking behavior and the selection of materials used as brake components. Material changes will help improve braking performance. A good braking performance can be found when it is capable of high heat dissipation and wear resistance. A better material selection will change heat dissipation capability and has high wear resistance is very necessary. Besides the materials, the design of the brake components is also important. The use of a ventilated brake design with an additional heat pipe can reduce temperatures by up to 10% compared to conventional ventilated disks. This article will present a study about how to make the best design by providing a study about component properties characteristics.

Keywords: Brake system; Heat transfer; Brake cooling system; Friction brake; Heat management

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Pantograph impact on overall external noise of a railway vehicle

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Abstract

The paper is focused on investigation of noise generated by pantograph used on new electric multiple units and some possibilities of noise reduction. Basic theory on noise generated by rolling stock is presented. Measurements results from real operation of electric multiple unit Skoda series 671 using an acoustic camera Soundcam are presented and discussed. Possibilities of the acoustic camera for visualization of acoustic field on specific location of investigated railway vehicle are presented. This way it is possible to determine particular noise component caused by pantograph during run of the particular train, though relatively low compared to other sources.

Keywords: aerodynamic noise; railway noise; noise reduction; pantograph

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Acoustic diagnostics of railway vehicles

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Abstract

Maintenance of railway vehicles is very important to achieve required safety, comfort for passengers and to sustain desired operational costs. Nowadays, it is possible to use multiple tools for diagnostics of a technical condition of railway vehicles. The paper focuses on the use of acoustics in the diagnosis of the technical condition of railway vehicles while train running, where we monitor the technical condition of individual carriages and their comparison in terms of their noise. Some possibilities of further application for practical use in the operation of railway carriages from the point of view of effective reduction of their noise are also presented.

Keywords: acoustics; acoustic camera; railway vehicle; maintenance; diagnostics

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Evaluation of acoustic parameters of air conditioning of railway passenger cars

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Abstract

The paper compares the noise produced by air conditioning in two railway wagons of two generations (manufactured in 199 and 2020) of 1 class of one manufacturer. In the wagon interior space, the air conditioning must ensure thermal comfort and hygienic exchange of air for the passengers. These parameters are key in the air conditioning of a railway wagon, but more stringent legislative requirements places ever higher demands, especially on the amount of supplied air and its treatment. As the air flow increases, it is not possible to increase the pipe diameter, especially due to the dimensional limitation in the wagon, which results in an increase in noise caused by higher airflow speed.

Keywords: acoustics; acoustic camera; railway vehicle; maintenance; diagnostics

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Transport of water and methane particles in a reactor to produce natural gas hydrates

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Abstract

Energy storage is an interesting phenomenon today that has the potential to move forward. Accumulation of energy in the form of a hydrate is important in terms of transport options to the site of coverage of unexpected energy peaks in the technology industry. Natural gas hydrate is in the solid state, which makes up about 85% of the water and 15% of the gas bound in the clathrate lattice. Insufficient research and development of hydrates has caused that the real application in convection systems of natural gas accumulation is in the phase of theoretical studies. This unconventional energy source is currently destined for the distant path to energy efficiency. The main aim of the article is to describe the parameters that affect the rate of hydrate formation. The article presents a basic analysis of the phase equilibrium criteria of methane hydrate. Storing energy in a form suitable for safe storage and further release is a current efficiency in processes that use the need to store energy.

Keywords: Energy storage; methane; hydrate formation; experimental device.

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Method of precise determination of the main causes of the problems on example of the pin connecting discs in an engine gear

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Abstract

The aim is to present an original combination of methods allowing to precisely determine the main causes of problems. The concept of the method assumes generating as many causes of a problem as possible, grouping them, visualizing, and precisely analyzing to determine the main cause of problem. The method combines the techniques such as Brainstorm, Cause-and-Effect Diagram, Fuzzy TOPSIS method (Fuzzy Technique for Order Preference by Similarity to Ideal Solution) and Fuzzy AHP method (Fuzzy Analytic Hierarchy Process). The method was tested for incompatibilities of products used in the automotive industry. The problem was a crack of the pin connecting discs in the engine gear when grinding. After used the proposed combined method, it was concluded that the main cause of this problem was the poor seating of the grinding wheel on the product. The originality of the article lies in the combination of selected quality management instruments and two fuzzy multi-criteria decision methods within one, consistent method of precisely determining various types of problems (taking into account the problems in the automotive industry).

Keywords: products quality; automotive industry; mechanical engineering; determine causes problems; Fuzzy AHP; Fuzzy TOPSIS

Analysis of quality control efficiency in the automotive industry

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Abstract

The paper deals with the issue relating to the improvement of the production process through the use of checkpoints. Quality control points used in an industrial enterprise manufacturing oil pans for heavy vehicles are discussed. The study aimed to present a proposal for a method for analyzing the effectiveness of individual control methods used as part of quality control in the manufacturing process of a product and to analyze the relationship between the type of quality control methods and their contribution to the detection of nonconformities of the product - an oil pan. By locating the control point with the highest share of product nonconformity detection, it is possible to take improvement actions - reducing control points by less effective ones. This action will contribute to cost reduction and shortening of the production process time. Due to the increasing demands on the efficiency and effectiveness of control points of automotive powertrain components, this issue is important and topical.

Keywords: Quality control point, mechanical engineering, management and quality

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Analysis of Monohull Design Characteristics as Supporting Vessel for the COVID-19 Medical Treatment and Logistic

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Abstract

The world is being hit by a health crisis by the COVID-19 pandemic which has infected peoples across the globe. The cases of COVID-19 in Indonesia itself continue to increase every day. The transportation sector is one of the sectors that have experienced numbers of direct impacts as a result of large-scale social restriction in form of preventive regulation. Furthermore, this phenomenon causes health agencies to experience difficulties in distributing logistics for handling COVID-19, especially in water areas. In the era of the Industrial Revolution 4.0, various society aspects and industrial processes are digitally connected to increase productivity, especially for COVID-19 treatment and logistic handling. This research was conducted to analyze several proposed monohull-unmanned ship prototypes which are expected to be a proposed solution to assist COVID-19 countermeasure. A series of stability and motion analyses is conducted, then the results are assessed to conclude the best design among the proposed design options. Results of the study indicated that compared to three variations of hull types, design of the Model III has excellent characterisics of ship stability, hull resistance and seakeeping. These analysis parameters are considered as main criteria in the ship's requirements since patient and logistic have to be transported safely to the designated location according to the given mission in assisting COVID-19 handling and treatment.

Keywords: COVID-19; transportation and distribution; monohull; ship stability; seakeeping.

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Determination of pressure loss of silencers during air transport in air conditioning

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Abstract

During each operation of the ventilation system, noise is generated, which is related to the operation of the fan during the transport of air. Attention must be paid to this noise, as the noise and depressions caused by the fan are transmitted through the pipes to the air distribution elements and thus disturb the indoor environment of the buildings. Each part of the ventilation system either absorbs or generates noise. Noise propagating and generated in pipes and fittings can be reduced in several ways, for example by dimensioning the pipes. However, noise and vibration that occur directly in the air handling unit must be eliminated in another way. Therefore, a component called a silencer is installed directly behind the air handling unit. For the correct operation of the dampers, it is necessary to monitor not only their acoustic attenuation, but also its pressure loss. The aim of this work is to verify the authenticity of the values given by the calculation program from the company Technov. To achieve the goal, it was necessary to build a measurement-verified CFD model, which would allow the calculation for silencers with other dimensions.

Keywords: air conditioning; CFD; presure loss; silencer;

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Application of basic machine learning algorithms in railway brake disc temperature prediction

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Abstract

This article is focused on brake disc temperature prediction introducing basic machine learning algorithms to reach this goal. In the first part, the problematics of brake disc frictional heating is described. Next, the methods currently used for predicting/calculating are described as well as their pros and cons. In the following part, some basic machine learning algorithms are described only very briefly, since going into details of theories of those algorithms in this article would extend it significantly. In the last part, the experiment with small dataset is described and its results and future possible work are discussed.

Keywords: brake disc, temperature prediction, machine learning algorithms

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The dependence of the brake disc aerodynamic drag on the rolling stock motion speed

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Abstract

For high-speed trains, the issue of the effectiveness of braking systems, as well as the aerodynamic moment of resistance which arises when braking with a disc brake and leads to a decrease in the traction power of the train, is urgent. The article discusses the amount of aerodynamic losses that can be caused by brake discs. The aerodynamic drag of various ventilated disc designs as well as a solid disc has been evaluated. By analyzing the described measurement and simulation data, the dependences of aerodynamic losses on the rotational and linear speed of the rolling stock are derived for different disk designs, namely, for radial vane, tangential vane, combined and solid discs. An example of calculating the amount of ventilation losses for different train formations is shown.

Keywords: brake disc; aerodynamic resistance; ventilated channels.

Changes of mechanical properties of protective polyethylene films applied in transport bottles and containers for liquid media after exposure to selected liquid media

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Abstract

Polymers have effectual applications in many industrial branches. Especially in the automotive and food industry polymers are frequently applied. Thermoplastics can be used also including the transport of specific liquids. This study deals with an investigation of the mechanical properties of polyethylene film made of low-density polyethylene (LD-PE), which has a low density and high degree of chain branching. LD-PE film was exposed to chemical influences of selected liquid media (Savo disinfection, Savo Saponate, and Coca-Cola) for three months. Those media have a different value of potencia hydrogeni (pH). Degradation of mechanical properties of LD-PE film by selected media was monitored. Using tensile test important parameters: σB, εB and E for polymers were evaluated. After exposure, those values of parameters increased in comparison with values of original LD-PE film in the longitudinal direction. The increase of tensile stress at break (σB) in comparison with original LD-PE film was as following: for Savo disinfection - increase of 83.43 %, Savo Saponate - increase of 68.60 %, and Coca-Cola - increase of 67.63 %. In the transversal direction, the exposure in media has a different impact on investigated parameters. The increase of tensile stress at break (σB) in comparison with the original LD-PE film was as following: for Savo disinfection - increase of 14.06 %, and Savo Saponate - increase of 33.02 %. For Coca-Cola was recorded a reduction of 36.90 % in comparison with original LD-PE film. Savo disinfection and Savo Saponate have the most suitable influences on the mechanical properties of LD-PE film for the transport of those liquids after three months.

Keywords: polymers; polyethylene; mechanical properties; LD-PE film for transport.

Use of loop thermosyphon as an efficient way of heat dissipation in transport facilities

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Abstract

The possibilities of using heat pipes have an irreplaceable place also in the field of technologies used in transport. The use of these passive heat transfer devices is becoming an increasingly topical, applied and economically advantageous area. At a time of significant electronic transport, each electrical element produces a certain amount of heat loss. An efficient way of using these energy losses is also possible through heat pipes, which work on the principle of phase changes. Precisely for this reason, this scientific work is also devoted to a more detailed study of the processes taking place in a heat pipe, which is located in a space with electrical equipment. The main area of research is concentrated on the evaporation process, which depends on the amount of filling the evaporating part of the heat pipe with the working substance with water. The amount of heat transferred was also monitored. The results of experimental measurements provide specific information on the course of the evaporation itself and will be used in further research with heat pipes.

Keywords: loop thermosyphon, heat transfer, amount of working substance

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Lenoir friction damper and its applications

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Abstract

This paper deals with the Lenoir friction damper and its applications. The first part mentions the basics of friction damping. The concept of dry friction is explained. Also, there are shown some models of friction forces depending on damping value and some basic graphs of Coulomb law. Next, the construction of the Lenoir friction damper is described. In the next part, there are some applications of Lenoir friction dampers on one of the most used freight bogie and its derivate. Some technical parameters of these are described. In the last part, possible future implications of my doctoral thesis are discussed together with the benefits of this topic for the future of railway transportation.

Keywords: friction, damper, Y25, TVP 2007, Lenoir

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Corrosion behaviour of PEO coating sealed by water based preservative containing corrosion inhibitors

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Abstract

The corrosion behavior of duplex surface treatedAZ31 magnesium alloy was studied. The surface of AZ31 magnesium alloy was modified using plasma electrolytic oxidation (PEO) with subsequent sealing of the pores present in the coating using water based preservative containing corrosion inhibitors. Electrochemical corrosion tests were performed by electrochemical impedance spectroscopy and potentiodynamic polarization in 0.1M NaCl solution to continue with the previous studies by Kajánek (2019) and Hadzima (2020), immersion test was realized in 3.5% NaCl solution in order to simulate electrochemical corrosion in coastal areas. Results from immersion tests showed a significant improvement in the corrosion resistance via the duplex treatment compared to the both, uncoated AZ31 alloy as well as material surface treatment using simple PEO process. This fact was supported also by the results from electrochemical test compared to the tests performed on uncoated AZ31 alloy and simple PEO coated AZ31 alloy in the previous studies.

Keywords: magnesium alloy, corrosion, electrochemical impedance specrtoscopy, plasma electrolytic oxidation, corrosion inhibitors

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Examination of structural properties of a new railway wagon design for flammable substance transportation

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Abstract

The article covers information from the field of static strength tests of freight wagons, in this case the static strength test was performed on a Zans 95 m3 tank wagon. The introduction of the article contains the division and significance of freight wagon tests. Various types of test load in static tests which affect the vehicle structure are also mentioned. Subsequently, the test requirements are written together with the technical parameters of the tested wagon. The next chapter deals with measured quantities and the instruments used for measurement, as well as a schematic sketch of the location of some sensors. The final chapter contains a description of the individual tests, where the procedure of loading, stay, unloading and reading of values for all static tests examined within the article are given. In the conclusion, verbal opinion is added to the summary of measurement results and the wagon construction is evaluated in terms of meeting the required strength conditions. The article contains graphs and tables from the outputs of some measurements.

Keywords: tank wagon; strenght test; test procedure; deflections

An innovative design of a protective devicefor integrity of tank wagons in a collision

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Abstract

The article discusses the issue of improving the safety of dangerous goods transportation in railway tank wagons by means of the improved anti-climbing device designs. It was determined that in a collision of wagons, there is a high probability of damage of the integrity of the tank body by protruding structural elements of an adjacent wagon, in particular, a buffer. Analyses of structures of a protective device of a tank wagon bottom part in the case of such situations was carried out. Anti-climbing device designs and protective shields used in operation are described. Based on the analysis of designs and the requirements of standards, the design of an anti-climbing device has been developed. The material of a structure was selected based on the requirement to avoid plastic deformation under the loading force of 150 kN acting downwards. There are presented the results of the analysis of the stress-strain state of the developed structure of the anti-climbing device, which showed that the structure meets the requirements of RID T25 regulation as well as requirements of a producer railway vehicles.

Keywords: Railway, Tank; Anti-climbing device; Protective shields; Stress-strain state analysis

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Experimental verification of tank wagon's ability to transmit longitudinal forces in opposite track curves

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Abstract

The main objective of this article is to describe the experimental way of verifying the ability of a tank wagon to deal with longitudinal forces in opposite track curves. In the methodology part, the measured and assessed quantities are described as well as the testing equipment. Next, the trainset composition used during the measurement is presented. Finally, measured results are presented and compared to the limit values given by UIC leaflet. These results show good quality of design solution of parts of the vehicle and vehicle as a whole.

Keywords: tank wagon; longitudinal forces; opposite track curves

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Acoustic properties investigation of an innovative railway tank wagon at selected speeds

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Abstract

The article is focused on verification of noise characteristics of a prototype tank wagon Zans 95 m3 during operation. In the first part, the problematics of noise created by railway vehicles is described. The testing requirements were defined for the test of the tank wagon. The proper measurement setup was selected for weighted equivalent acoustic pressure level observation. Based on the TSI requirements, the measurement stand was assembled on the testing track, repeated measurements were performed, and the results were compared to the limit value related to wagon category.

Keywords: innovative tank wagon, noise analysis, driveability.

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Design of an airflow model for railway brake components testing

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Abstract

This article is focused on designing, preparing and solving the air flow model of an inlet pipe of ventilation of test bench for disc brake testing. In the first part, the importance and methods of testing brake components are discussed, and advantages offered by simulations in this field are presented. In the next part, the ventilation of the test bench and its requirements are described. Based on these assumptions, the boundary conditions for CFD simulation are set and the model has been solved. The results are presented and discussed in the final part.

Keywords: brake components testing, airflow, CFD simulation

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Possibilities of predicting undesirable iron intermetallic phasesin secondary Al-alloys

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Abstract

Today, aluminium is becoming the preferred construction material for transportation applications because it combines three basic properties: strength, durability and lightness. The use of aluminium castings is increasing in a wide range of transport applications. Another advantage of using aluminium materials is their ability to recycle. The use of recycled secondary aluminium alloy has many advantages; it is not only environmentally but also cost-effective. However, the main disadvantage of using a secondary aluminium alloy is the higher amount of iron. Iron in aluminium alloys forms various types of Fe-rich intermetallic phases. It is necessary to control the amount of iron and prediction the formation of undesirable iron intermetallic phases as "sludge" phases, and β-phases. β-phases cause feeding problems, create places with increased concentration of stress, increase casting porosity, and generally reduce plastic properties of the cast alloys. Sludge phases can compromise the machining operations, with a considerable effect on the cutting tool life, and even more degrade the mechanical and physical properties of the component. For the study and identification of intermetallic phases were used equations for calculating SF and critical iron content and observation on the microscope. The results show that coarse sludge, Fe-rich phases appear in the alloy D with 1.200 wt. % Fe. The value critical amount of iron has exceeded in alloy B with 0.679 wt. % Fe, alloy C with 1.209 wt. % Fe, and alloy D with 1.200 wt. % Fe.

Keywords: secondary aluminium alloy, sludge phases, Fe-intermetallic phases;

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Development of an automated diagnostic and inspection system based on artificial intelligence designed to eliminate risks in transport and industrial companies

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Abstract

The article focuses on the definition of risks management in industry and transport, which are associated with development of an automated diagnostic and inspection system based on artificial intelligence designed to eliminate risks in transport and industrial companies. The first part describes the process of risk management with respect to the current ISO standard and the second part of the article summarizes the options that can deal with risk in the company. Next parts are associated with particular technical system.

Keywords: transport; industry; risk; artificial intelligence

Influence of iron content on SDAS factor, Al_5FeSi intermetallic phases and porosity of the secondary aluminum alloy AlSi7Mg0.6 used in the automotive industry

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Abstract

This paper is focused on evaluating the influence of iron content on SDAS factor, Al5FeSi phase size, and porosity of secondary aluminum alloy AlSi7Mg0.6 used in the automotive industry. These characteristics were evaluated by quantitative analysis on sand-casted experimental alloys with various iron contents (0.128; 0.202; 0.429; 0.75; 1.264 %). Results have shown a decrease of SDAS factor with increasing of iron content. Al5FeSi phase average length and thickness values increased with the rising iron content. These dependencies began to reveal themselves when the iron content reached values around the critical value of the iron content - Fecrit. (0.475 % Fe). The average area of pores (2.05 - 3.8 %) and pore size (39 597 - 70 332 μm2) increased with increasing of iron content (0.128; 0.75; 1.264 %) too.

Keywords: aluminum alloy; porosity; intermetallic phases; secondary aluminum

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An experimental analysis of the forces impact of a new structural design of a three-axle railway bogie to a track

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Abstract

The article describes the analysis of the impact of a three-axle bogie ELH-3R installed under a platform wagon type Samms on the railway track. The computer calculation of indicators of the track impact is described when the wagon moves along tangent and curved track sections with radii of 430 and 650 meters. While doing that, the cases of the movement of the platform wagon in an empty and fully loaded state were considered. The simulation was carried out at different motion speeds depending on the investigated track on sand or gravel ballast. Based on the calculation results, an assessment of the compliance of the indicators of the three-axle bogie impact on the track with the requirements of the corresponding standards was made.

Keywords: three-axle bogie; impact on the track; track impact indicators.

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Utilization of solid fuels with regard to the transport distances of the raw material

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Abstract

The fundamental problem of the modern society is the waste of resources and our ever-increasing need for energy. A new trend in the EU's green policy in decreasing carbon footprint and ensuring the energy self-sufficiency of the member states is leading us to look for alternative types of fuels. Stocks of fossil fuels are dwindling and there is no point in burning them to release energy for heating or to transport materials over long distances if local resources can be used. Our goal was to follow new trends in the development of new combustion materials with regard to the transport prices of individual types of fuels focusing on the use of renewable energy sources such as alternative forms of biomass. In our research, was compared three types of fuel such as natural gas, mixed wood chips and brown coal lignite in terms of transportation and processing prices with regard to their combustion properties. The research results clearly show the paradox that alternative biomass in the form of wood chips has the lowest processing costs but the highest transport cost. However, due to the close availability of the raw material, biomass price was still the cheapest only 0,0275 €/kWh. This price calculation proves that alternative biomass can be used as an effective and ecologic replacement for fossil coal in many EU thermal power plants.

Keywords: transport distances, solid fuels utilization, ecological combustion

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An overview of robot applications in automotive industry

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Abstract

The paper deals with an overview of industrial robot usage possibility in automotive industry which nowadays is the most important customer of industrial robotic market. The first part of paper describes the situation of industrial robot usage and offers an overview of application of robots in world industry. Later we deal with the most common applications of robots, especially in the automotive industry, as well as trends and perspectives on the future of automotive robotics. Finally, there was presented a model task from real industrial practice in form of specific project overview about robotized tightening of screws on the production line of car seats at the end of the article.

Keywords: industrial robot; robotics in automotive; production of passenger cars; transport and production; automated assembly line

Concept of flexible transport system for components distribution within the production hall based on self-navigated mobile robot

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Abstract

The article deals with the conceptual design of wheeled mobile robot intended for the components` in-process transport between the warehouse and assembly and testing area within the production hall. The design process includes the development of the mechanical, drive, sensor and control subsystems as well as a navigation system. At the end of the article, the possibilities of further expansion of the robot's capabilities are outlined, through the software of path planning and space mapping on a remote computer, as well as the possibility of supplementing the operator tracking function.

Keywords: mobile robot; navigation; in-process transport; control system

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Calculation of the geometric transit through the track curves of a two-section platform wagon

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Abstract

This paper focuses on calculations of the geometric passage of a two-section platform wagon through a curve. The aim is to determine the angles of rotation of the bogies to the main frame, angles of deflection of automatic couplings when passing through chosen sections of rails and minimal radius of curve in which the possibility of automatic coupling with another rolling stock is ensured. Results have shown that the automatic coupling is ensured in case of passing a two-link platform wagon coupled to the standard wagon through arc S with a nominative radius of 120m. The angle of departure of the automatic coupling shall be 9.96°. In case of passing two coupled platform wagons through arc S of a nominative radius of 120m and in case of a passing a two-link platform wagon coupled to a standard wagon through a section connecting straight track to an arc of nominative radius of 80m, passage without jamming the automatic coupling shall not be ensured. In order to ensure it, the maximum angle of departure of the automatic coupling shall be at least 13.5°. In case of passing a double platform wagon through a section of straight track and curve connection, the minimum radius of curve to ensure reliable operation is 142 m.

Keywords: rail vehicle, platform wagon, passage through arc S, automatic coupling

Analysis of the internal damping on temperature of magnesium alloy evaluated for different states of material

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Abstract

The application of magnesium alloys in automotive is witness the developments and successful application of these alloys in automotive components and they have a potential application for car body, cylinder blocks and engine block. The article is focused on chemical analysis, evaluation of microstructures and measurement of internal damping depending on the temperature of the experimental material. The commercially available magnesium alloy AZ61 was chosen as the experimental material. Changes of internal damping depending on temperature were measured for the material in the initial state, in the state after the respective heat treatment and in the state after plastic deformation. Measurements of the temperature dependence of the internal damping took place from room temperature to 400 °C and the measured values of internal damping were then graphically evaluated and compared.

Keywords: Magnesium alloy, internal damping, initial state, solution annealing, plastic deformation.

Determining the strength indexes of the bearing structure of the flat wagon of articulated type made from round pipes

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Abstract

In the article the parameters of the structural strength of the flat wagon of articulated type made from round pipes has been determined. The model of the strength of the bearing structure of a flat wagon of an articulated type from round pipes is present. The calculation is based on the finite element method implemented in the CosmosWorks programming environment. Isoparametric tetrahedra were used when constructed the finite-element model of the bearing structure. The strength parameters of the bearing structure of a flat wagon of an articulated type from round pipes were determined.

Keywords: flat wagon; round pipes; strength; stressed state.

Creating mathematical model of the bearing structure dynamic load of the flat wagon from round pipes in the main operational modes

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Abstract

At the present stage of development of the railway industry it is necessary to introduce new innovative solutions during the design of the flat wagons of articulated type for their structural design. To reduce the material consumption of flat wagons, in article was proposed to produce bearing elements of their structures from pipes of a circular cross section. Flat wagon of articulated type was designed on the basis of the developed construction in order to improve the operational efficiency of the wagon. The innovation design of a flat wagon of articulated type from round pipes are presented. The mathematical model of the bearing structure dynamic load of the flat wagon from round pipes in the main operational modes are made. Accelerations which act on the bearing structure of articulated flat wagon under I rated conditions (tension – jump) are presented.

Keywords: flat wagon; round pipes; longitudinal force; acceleration.

TOPIC 3 - Electrical Engineering in Transport

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Impact of user orientation on indoor localization based on Wi-Fi

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Abstract

Since GPS positioning is not reliable indoors due to problems with signal propagation, alternative solutions have to be used for navigation and monitoring of pedestrians as well as vehicles. The ubiquitous availability of Wi-Fi and its applicability in indoor positioning attract a lot of attention. The Wi-Fi Fingerprinting method is the most common method to estimate the localization of mobile users since its performance does not seem to be affected by multipath propagation. To compensate for the impact of the human body on signal propagation as well as irregularities in antenna gain the Orientated Fingerprinting Database was created. A built-in compass in mobile devices was used for the determination of the orientation of the user and was used as an additional parameter in the localization process. The proposed solution was tested in real-world conditions and compared with the accuracy of the system without orientation measurements. The RMSE with a compass was 4.04 m and without a compass was between 4.21 m up to 5.73 m. From the achieved results it seems that orientation information can help to improve the performance of the localization system, however, it will increase the complexity of the system deployment significantly.

Keywords: localization; orientation; fingerprinting; Wi-Fi; NN

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Design and evaluation of low power wireless charger concept

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Abstract

This article deals with the concept proposal of the wireless charger for low power application areas. As wireless charging undertakes popularity, initially the state of the art within application area is realized, while main focus is given on the personal e-mobility mean of transport. The most suitable configuration of power electronic system is initially discussed, whereby several power converter stages are equipped within physical prototype as well. The biggest attention is given on the construction of the coupling elements, while design procedure is supported by the finite element analysis. The modelling of coupling coils element enables to improve physical model by the shielding system due to achievement of the required operational characteristics defined by bio-combability standards. The experimental part of the paper is discussing investigation of the operational characteristics of the whole wireless charging system. Here the efficiency characteristics in dependency on output power and transmitting distance is evaluated. Received results confirm suitability of the presented design approach and practical use of proposed wireless charger for e-scooter or e-bikes applications.

Keywords: wireless charging system; e-scooter; simulation design; experimental verification

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Two five-phase induction motors used as an electronic differential

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Abstract

In hybrid and electric vehicles (HEV and EV), the electric motor is powered by power semiconductor systems. The most common is a voltage source inverter, hereinafter referred to as VSI, which converts direct current energy from traction batteries into alternating current energy, which supplies an asynchronous or synchronous motor. For HEV and EV we distinguish different concepts of motor connection. One of these concepts is the use of two electric motors that directly drive the individual wheels of the rear axle. By controlling these two engines, we can ensure the function of the differential. The problem is that the two motors must be controlled independently of each other. If we use three-phase electric motors, then we must supply each motor from its own VSI and thus achieve independent control of these two motors. However, a different situation occurs if we use two five-phase induction motors. In this case, it is possible to supply two motors from one VSI, while their independent control is possible. This paper presents the concept of an electronic differential, which consists of two five-phase induction motors, powered by one VSI and a mathematical block, which directly determines the speed of individual motors based on the steering wheel angle.

Keywords: Induction motor; five-phase system; independent control; differential; electronic

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Design of precise simulation model of power converter of energy storage system located within micro-grids

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Abstract

In this paper, the modeling procedure of the bidirectional power converter for energy storage systems located within microgrids is being described. The aim was to develop simulation model with accurate behavior compared to experimental sample, due to implementation of the model within system-level simulations of complex microgrid systems. Simulations have been performed with PLECS circuit simulator. Also experimental sample similar to circuit topology of simulation model was realized within reduced power ration of the target application (1:10). Simulation models have been optimized based on laboratory findings to obtain the maximum degree of operating property precision possible. As a result of this approach, high-accuracy simulation models of DC microgrid systems can be created, allowing any operating scenario to be investigated at the appropriate power delivery.

Keywords: high efficiency, high frequency, switching converter, modular system, energy hub, smart grid

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Comparison between model based and non-model based sensorless methods of brushed DC motor

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Abstract

This paper presents a comparison between sensorless techniques for estimating speed of brushed DC motor. These techniques can be classified into two groups: model based methods, non-model based methods. The model based methods use a dynamic model of DC motor, where a sliding mode observer, pseudo-sliding mode observer and observer with PI controller are presented. The non-model based methods use a ripple component of DC motor current, where the motor speed is estimated by applying a novel approach. This approach uses a discrete bandpass filter with a floating bandwidth to extract information about the motor speed from the measured motor current. The results obtained from the experimental verification indicate that the novel approach estimates the motor speed correctly in a wide range of speeds.

Keywords: sensorless control; brushed DC motor; bandpass filter; current ripple;

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Field oriented control adjustment for 6-phase permanent magnet synchronous machines

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Abstract

The paper contains PI controllers setting, for field oriented control of 6-phase machines with permanent magnets. Two basic and the mostly used approaches for current and speed control are discussed and compared to each other. The first approach is based on a one orthogonal system and second deals with two orthogonal systems. Mathematical models behaviour is analysed and verified by Matlab simulations.

Keywords: 6-phase machine; multiphase machine; field oriented control; regulation; control structure

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Selection of modern LED fittings for SMART installations considering THD and PF worseness due to dimming

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Abstract

This article reports an analysis of problematics of negative influences of SMART LED light installations aimed on current distortion and circulation of reactive energy. Article describes main principals of negative influences based on direct confrontation with actual standards (CENELEC, NEMA, ENERGY STAR). Article briefly explains behavior of LED drivers under nominal and dimmed conditions up to critical level. Measurements confirm issues reported by users from larger installations, where LED fittings are dimmed over certain level, or low-quality LED driver is used in LED fitting. Currently used limitations set by EN standards seems to be insufficient along the new generations of LED fitting, with higher lumen output ratings and its "optional dimmability." Therefore, article sets pre-evaluate method of limiting the negative influences of dimmed LED installation, using combination of experimental methods and gathering information from datasheets of LED drivers.

Keywords: Dimmed LED fitting installations; power factor; pre-evaluation method of negative influence of LED fiitings in SMART installations

Effect of increasing the sampling frequency with respect to the bandwidth of the PI controller of current control loop

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Abstract

Paper examines the behavior of a vector-controlled drive with permanent magnet synchronous motor upon changes in the sampling frequency of employed PI controller in current control loop with respect to the bandwidth of said PI controller. Paper analyzes key hardware and software requirements which makes a limitation for sampling frequency and bandwidth increasing.

Keywords: bandwidth; high sampling frequency; field-oriented control; permanent magnet synchronous motor

RFID tags at the operation of fire stations

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Abstract

Speed, efficiency, and reliability are the key characteristics of virtually any process or system in today's world, so they cannot be missing even in the protection of the highest value - human life. These assumptions should not be missing even in cases of the intervention of fire brigades when it is necessary to protect not just human life but also their property. The current situation in the management of technical equipment at fire stations is not the most effective option that today's technologies offer. The current trend in technology is the integration of systems and the creation of a so-called smart solution. The use of RFID technology in conjunction with current systems for the operation of a fire station would allow working at a higher level of the already mentioned assumptions. A simple inventory using this wireless technology would allow a clear overview of the situation and available resources at a fire station. The design of such a system would be very complex and extensive. The following text contains the results of testing of selected passive RFID tags and a summary of information that can serve as a basis for further research.

Keywords: Fire brigades; Integrated Rescue System; Efficiency; Testing; Radio Frequency Identification

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3D Optical Splitter based on MMI

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Abstract

In this paper, we propose and simulate a new type of three-dimensional (3D) optical splitter based on multimode interference (MMI) for the wavelength of 1550 nm. The splitter was proposed on the square basis with the width of 20 x 20 μm2 using the IP Dip polymer as a standard material for 3D laser lithography. We present the optical field distribution in the proposed MMI splitter and its integration possibility on optical fiber. The design is aimed to the possible fabrication process using the 3D laser lithography for forthcoming experiments.

Keywords: MMI splitters, 3D MMI splitters, polymer, DLW

Nanostructures for plasmonic and solar applications

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Abstract

The improvement of solar energy conversion has been largely investigated in recent years. Studies show that the incorporation of rough surface for increased light scattering efficiency in combination with surface plasmon resonance (SPR) offers significant absorption enhancement. In this paper we present the design, simulation and fabrication of multiple periodic plasmonic arrays with different nanoaperture diameters for broadband enhancement of optical absorption. Structure of periodic nanoapertures consisting of nickel (Ni), titanium dioxide (TiO_2) and gold (Au) was first designed, simulated and fabricated using nanoimprint lithography and deposition techniques. Optical measurements were carried using Cary 6000i internal diffuse reflectance accessory. Structures of different aperture diameters were prepared and characterized. The best results show an absorption over 92% through predominant part of visible spectrum for 250 nm aperture.

Keywords: Nanoaperture array; Plasmonics; LSPR;

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On-line identification methods as part of the tunnel ventilation control algorithm

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Abstract

The paper presents algorithms of on-line methods of discrete parametric identification of pollutant concentrations in a tunnel tube and comparison of their properties. It describes the characteristics of an individual methods and a detailed evaluation in order to select the most suitable method for the identification of dynamical systems with a significant stochastic component and changing parameters. The aim of the paper is to propose discrete parametric identification methods for systems that have variable parameters. It is a choice of model structure and design of an algorithm that is able to monitor changes in system parameters. The article also describes ways to implement identification algorithms in PLC (Programmable Logic Controller) by programming the target device directly from the simulation environment MATLAB Simulink using the toolbox "B&R Automation Studio Target for Simulink". From a practical point of view, these algorithms serve to create an apparatus for optimizing the ventilation control in the tunnel and thus ensure the safe passage of vehicles through the tunnel.

Keywords: PLC; identification; algorithm implementation; ventilation control in the tunnel

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IoT-based Data Acquisition Unit for aircraft and road vehicle

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Abstract

This paper describes the development of a Data Acquisition Unit (DAU). The device is primarily designed for light aircraft; however, it allows data collection from road vehicles (equipped with Bluetooth module to measure the engine and vehicle data from onboard diagnostics interface). The primary purpose of DAU is the Internet of Things (IoT) based tracking of aircraft operated by the Air Training and Educational Centre (LVVC) of the University of Žilina. If some flight parameters exceed the given limitations, the data file is marked as a non-compliance flight record. LVVC utilises this to get the information if unauthorised manoeuvres with the aeroplane were performed. The device is also used as a real-time tracker and anti-collision system. Several test flights were performed to proof of concept. The acquired data will also be used for analysing localisation algorithms at the Department of control and information systems of the University of Žilina and is the predecessor of the proposed APVV project.

Keywords: IoT; GNSS; RPM; acceleration; aircraft; road vehicle

Diagnostics of Insulating Condition of Traction Transformer by Frequency Method

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Abstract

In the paper is presented experimental analysis and diagnostics of insulating system oil-paper for traction transformer by frequency method. In the first part of the paper is described base theory about measurement and diagnostics insulating part (oil and paper) of transformers. In the other part of the paper is presented experimental results of the diagnostic measurement for the traction transformer at constant temperature using to diagnostic method - frequency domain spectroscopy (FDS). This method is used for analysis insulating condition of high-voltage equipment with insulating oil-paper. According to follow analysis was compared quality of paper moisture and oil conductivity of transformer - before and after its drying.

Keywords: insulating system; traction transformer; frequency dielectric spectroscopy

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Design of Two Wheeled Vehicle Steering Structure

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Abstract

With the growing interest in small passenger cars without an internal combustion engine, with the electric motor, new requirements for driving characteristics and appearance are also emerging. In this paper, we will try to design a universal steering structure for a two-wheeled vehicle by arranging the wheels in parallel inside the vehicle construction. The paper describes a current and position loop with PI and PD regulators suitable for a two-wheeled vehicle. By simplifying the steering, a structure for a single-wheeled vehicle can be achieved. Finally, the results and recommendations of the adjustment for further work with the proposed structure are evaluated.

Keywords: stabilize; Matlab; two wheeled; position loop; current loop

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Diagnostics of fuel systems in petrol vehicles

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Abstract

The article is focused on measuring the current flowing through the injector with subsequent detection of faults in the fuel system. The claims are based on measurements and residue generation (differences between reference and fault current). Impairments of injector needle valve movement and fuel pressure changes were simulated.

Keywords: Injector; fuel system; diagnostics; measurement

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Comparison of Various PMSM Rotor Topologies for High-speed Drives in Automotive Applications

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Abstract

This paper describes comparative analysis of different rotor topologies of cylindrical type high-speed PMSM for automotive applications. Utilizing Ansys software, 4 types of PMSM with different rotor topologies are modeled with the same stator of 6 slots / 4 poles configuration, same rotor diameter and air gap length. Electromagnetic performances of these topologies are analyzed with FEA method approach. Analysis provides comparison of synchronous inductances, developed torque, current consumptions, output powers, core losses and efficiencies of analyzed topologies. Obtained results from this comparative analysis will be decisive for election of appropriate PMSM topology, which will then be further analyzed for mechanical and thermal properties. Final design PMSM is aimed to be capable of reaching 100 000 rpm with low losses and satisfactory efficiency, output power and torque. It is to be operated from vehicle onboard grid of DC 48 V via DC/3f-AC inverter.

Keywords: automotive; high-speed; PMSM; FEA

Investigation of Rotor Parameters of High Speed Switched Reluctance Motor for automotive application

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Abstract

This paper presents an analysis of the rotor geometric dimensions influence on the electromagnetic parameters of high speed switched reluctance motor (SRM). This high speed SRM is optimized for automotive application. The paper starts with introduction that describes this type of motor and state of the art of high speed machines. The state of the motor design before this analysis is presented. The next part presents the analysis that was performed in Ansys for case of single pulse operation and hysteresis control. In this analysis, values of maximum phase current, average torque, torque ripple and losses as function of change in rotor geometric dimensions were observed. These dimensions include: rotor outer diameter, length of rotor teeth, rotor pole arc and rotor yoke thickness. Finally, the obtained results are presented and commented.

Keywords: high speed; switched reluctance motor; optimizaion;

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Comparative electromagnetic design of high-speed PMSM with reduced torque ripple for automotive application, part 1 – stator design

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Abstract

This paper concerns the initial motor sizing of a high-speed permanent magnet synchronous motor (HSPMSM), that will be used in educational and research applications. Starting dimensions are chosen from an existing machine topology. In the first part, the motor optimization is performed w.r.t. optimal magnetic loading of the stator, for a fixed rotor topology. The rotor optimization is not included, because further thermal and especially mechanical simulations must be conducted.

Keywords: PMSM; electromagnetic design; permanent magnets; low-loss steel; high-speed

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Universal firefighter sensor for dangerous road tunnel environment

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Abstract

This article deals with the issue of detecting and measuring the concentration of dangerous substances in the road tunnel during an accident, in order to minimize the risk to the firefighter during the intervention. The article also includes the design and construction of a mobile sensor system together with the processing of data and a suitable presentation of measured data. The gases are measured by specific detectors of the MQ gas sensors series. NTC type thermistors were used for temperature measuring. The control unit for the mentioned universal sensor is the development board D1 mini Pro, which has an integrated Wi-Fi chip. The universal sensor was designed especially for firefighters intervening during an accident in road tunnels. The measured data are processed and then sent via Wi-Fi network to an external database, from which they are then conveniently presented on the website. The website is then viewed on-line data from sensor for firefighters, whose are intervening during an accident in the tunnel.

Keywords: tunnel; gas detection; dangerous substances; MQ sensors; universal sensor

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Two-wheel electric chassis with automatic balancing

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Abstract

This work deals with the construction of an electric vehicle. This vehicle is designed to transport one person for shorter distances in urban areas. The main control member is a microcontroller from Atmel corporation. The aim was to construct vehicle in the best possible ratio of price and quality. The device consists of a mechanical part, a drive part and a control part. The whole vehicle is powered by a battery. A PID controller is used to balance the vehicle.

Keywords: Segway; microcontroller; PID; Atmel

TOPIC 4: Civil Engineering in Transport

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Authors are responsible for language and content of their abstracts.

Comparison of pavement morphology in the Povazsky Chlmec tunnel before and after maintenance

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Abstract

Roughness is one of the most important variables affecting the safety of vehicles on the road. Insufficient road surface roughness can lead to loss of vehicle handling, which in turn leads to an increased likelihood of an accident. Roughness as a variable parameter of pavement must be monitored during the life cycle of the road to ensure its operational capability. The article deals with determining the roughness characteristics using three different devices - TWO, British pendulum tester, and SRS. This is the road surface on the section of the D3 highway in the Povazsky Chlmec tunnel, where road maintenance was planned. The main goal was to compare the quality of the pavement before and after road maintenance, where an increase in the coefficient of skid friction was found after the maintenance of the road.

Keywords: Roughness; Friction; Pavement; Morphology

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Crashworthiness of brittle blocks as cushioning elements for fixed objects around traffic lanes

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Abstract

The proportion of motor vehicle crash deaths involving a collision with fixed objects is not decreasing. To address this issue and consequently to decrease transportation hazards, a novel crash cushion comprised of load-bearing blocks was introduced. Its alpha version is easily and inexpensively obtainable; the beta version is suitable for use in harsh environments. In this contribution, the effect of the collision on imaginary vehicle passengers is examined. Besides, the effect of impact velocity on collision severity is discussed and both versions of crash cushions are compared in occupant injury potential. The effect of a combination of crash cushions with different crashworthiness measures is also studied. Inferences drawn from this study can be used by designers and con-tractors to assess the collision severity and optimize the use of the cushioning elements. The presented cushioning elements can replace stones and solid blocks in cross-drainage culverts, but hypothetically they could also be used in other structures which pose risks around traffic lanes or in underwater protection of bridge piers.

Keywords: Load-bearing block; crash cushion; collision severity; vehicular impact

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Study of maritime accidents with hazardous substances involved: comparison of HNS and oil behaviours in marine environment

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Abstract

Due to the continuous development of the chemical industry as well as the ever-increasing demand for raw materials, trend of maritime transport of chemicals and hazardous substances has significantly increased in recent decades. This growth results in a rising number of accidents involving both types of chemicals -Hazardous and Noxious Substances (HNSs) and oily substances.
The continuous increasing of number of hazardous substances transported by seas, was a trigger for the competent authorities to focus on the prepare and response to a possible risk of release of such substances. Even though the risk of leakage and spill of hazardous substances is currently on the low level (as a result of the high safety standards), it still does exist.
The main objective of this paper is to provide a comprehensive overview of the past accidents involving hazardous substances globally, with a focus on the HNS and oily substances spilled at the sea. The analysis is focused primarily on liquid substances, but also data on the packaged goods with the dangerous properties is involved. Another significant output is represented by recommendations about correct responding to maritime accidents involving chemicals and other dangerous substances.

Keywords: chemicals, oily substances, HNS, maritime, spill, leakage, safety

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Morning modal split model of economically active people in Žilina region

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Abstract

The paper deals with the parameterization of the morning modal split in the four-step model of the traffic prognosis for the economically active population. Multiple Logit model theory is the process of calculating the modal split. This model is in common use for transport modeling. Its advantage is that we can choose from more independent variables. The estimation of Logit function parameters is based on a transport - sociological survey in the Žilina region.
The choice of a specific transport mode of transport is expressed by the utility function. The Biogeme program was used for the trip utility function parameters estimation. The primary task was to create a set of Logit functions performance parameters for Žilina region transport conditions, specifically for the economically active population group in the morning rush time (05:00 – 09:00). Person groups are characterized by their behavior in the transport process. The modal split was taken into account in the trip distribution by transport modes: car - driver, car - passenger, bike, pedestrian transport, public transport, bus and train.

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

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Analysis and assessment of environmental threats in maritime transport

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Abstract

The paper discusses the environmental impact assessment of key pollutants generated by vessels during maritime transport operations. For the purposes of this study, a vessel is considered as a system that can be broken down into main subsystems and system components. Maritime shipping is a relatively environmentally-friendly means of moving large cargo over long distances. It is the only mode of transport that can successfully take over cargo from hinterland traffic. Mobility improvements have forced people to use more complex energy sources, which has contributed to the development and upgrading of transport infrastructure. From the economic perspective, maritime transport is currently an optimal transport mode. The fast development of this sector, observed especially on the Far Eastern market, entails the elevated risk of polluting the marine environment as a result of ongoing operations as well as accidents. The objective of this paper is to analyse and evaluate the environmental hazards that may arise from the operation of ERRVs (Emergency Response and Rescue Vessels).

Keywords: maritime transport, waste management, pollution, ship-generated waste, sustainable transport, protection of the marine environment, risk analysis

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Half-warm mix asphalt with emulsion. An experimental study on workability and mechanical performances

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Abstract

One of the major sustainability-related challenge facing materials for asphalt pavements is the energy consumption and the release of harmful and odorous fumes. Reductions in these emission levels have been progressively achieved by a number of cleaner and low-temperature technologies. Recently, a further step towards an improved road pavement sustainability is represented by the half-warm mix asphalt (HWMA) mixtures, which are produced between 70 °C and 100 °C without negatively affecting their final performances. Among these methodological approaches, a very interesting solution for urban or low volume traffic roads is represented by HWMA mixtures prepared with a conventional warm emulsion and heated aggregates. Although this technique is capable of combining the advantages of hot and cold mixes, limiting some drawbacks, it is still little known and remains confined only to some regional areas (in Spain with the term mezclas templadas). There are no standards or specifications, but only some construction practices resulting from the experience gained in the field. Thus, a laboratory-scale experimental study was set up to analyze in detail the behavior of dense-graded HWMA mixes prepared with emulsion intended for a surface course layer of a low or medium traffic road. The objective was to evaluate the influence of three mix-design variables, such as compaction temperature, binder content and aggregate gradation on the volumetric and mechanical, i.e. indirect tensile strength and moisture susceptibility, properties of these mixtures. The rank comparison between the selected mixtures represented the starting point for improving on the one hand the mix-design process and on the other the operational procedures of production, transportation and placement.

Keywords: Asphalt emulsion, Half-warm mixtures; Mezclas templadas; Mix design; Low temperature asphalt; Sustainability

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The Impact of Emissions on the Environment within the Digital Economy

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Abstract

Currently, one of the biggest environmental problems is global warming. The category that directly affects global warming are greenhouse gases. In this context, Carbon dioxide emissions are the most substantial, as a result of which the earth's temperature has risen by almost 1 degree Celsius over the last 100 years. The paper focuses on the comparison of European Union countries in terms of Carbon dioxide pollution and also on a detailed description of Carbon dioxide pollution from the perspective of the transport sector in Slovakia. In addition, the paper contains predictions of Carbon dioxide emissions development from the point of view of two scenarios applied to Slovakia.

Keywords: Greenhouse gas, Carbon dioxide Emissions, Transport

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Proposal of a highly effective and affordable highway interchange - ITL Interchange

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Abstract

In this paper we present a new solution for the highway interchange, which represents the best compromise between the traffic capacity, the land area used and construction cost. The difference between the known and the new design solution is in the implementation of the opposite directional ramps which are widely separated in the area of the interchange. In the middle, between the directional ramps, some space is created for the left directional ramps. Interchange should be used for four-way highway interchanges or other heavy traffic roads junction in order to increase the capacity and traffic safety at the crossing point. It has no conflict points. ITL Interchange left directional ramps are much shorter than all other known solutions for interchanges. The interchange is built in two levels. These two facts significantly lower the cost of construction. The study compares different types of interchanges. We made a geometric comparison and performance measures. In geometric comparison, the greatest advantages of the ITL interchange are the shortest overall roadway length and the shortest overpasses length. Therefore, such an interchange is advantageous in terms of construction and maintenance costs. When measuring performance, ITL Interchange achieves the best results regardless of the number of vehicles.

Keywords: Highway; ITL Interchange; Left directional ramp, Traffic caapcity,

Influence of fiber length on load-bearing capacity of strengthened cross-section using fiber reinforced concrete

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Abstract

The article deals with the influence of steel fiber length on the load-bearing capacity of a strengthened reinforced concrete column using a layer of fiber reinforced concrete. The effect of fiber length on the compressive strength of fiber reinforced concrete is not as significant as on the tensile strength and flexural tensile strength. Fiber concrete has up to 50 to 100% higher tensile strength compared to plain concrete. This difference is due to the amount of fibers added and also to their length. For vertical elements that are stressed by a combination of axial force and bending moment, it is possible to use increased tensile strength of fiber reinforced concrete. Using the interaction diagram of the reinforced column, it is possible to determine the load-bearing capacity and then compare the load-bearing capacity increments at all points of the interaction diagram impressed with the length of the fibers.

Keywords: fibre concrete, strengthening, column, numerical analysis.

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Experimental and Numerical simulation of a Three Point Bending Test of a Stainless Steel Beam

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Abstract

An advanced simulation process of a stainless steel member in ANSYS technology is described in this paper. A three-point bending test of a hot rolled stainless steel material grade 1.4301 (AISI 304) member has been conducted. The cross-section of the beam was IPE80, with the span of the supports equal to 240 mm. The results of the experimental test were compared with the materially and geometrically nonlinear numerical analysis. In order to describe the behavior of the stainless steel material, the Ramberg and Osgood model has been adopted along with multi linear stress-strain description with isotropic hardening feature. The finite element model has been created using software ANSYS classic APDL environment, and the results were compared.

Keywords: Stainless steel; Three-point bending test; Finite element analysis; Ramberg and Osgood model

Dependences of Degradation of Long-Term Monitored Pavement from the Perspective of the Diagnosed Bearing Capacity

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Abstract

A necessary condition for the functioning of the road management system is the existence of a database of data from repeated measurements of selected roads on their technical parameters on the road network. The general designation - data means in particular invariable and variable technical parameters of roads, which are necessary for the evaluation of operational capability and condition of road structures. In the article, the authors deals with the analysis of two reference parameters of the pavement in relation to their degradation, namely the parameter Equivalent modulus of elasticity, and the curvature index of the road surface.

Keywords: degradation of pavement; bearing capacity; pavement management, pavement design

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Modelling of changes in pavement serviceability of the asphalt road

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Abstract

Parameter of pavement serviceability have a significant impact on road life and safety. For this reason, the research focuses on modeling changes in the parameters of pavement serviceability, which can be considered as one of the current problems of the pavement management system (PMS). Due to the deteriorating condition of roads, it is necessary to monitor the impact of changes in parameters on the resulting effectiveness of the repair. The cost-effectiveness of spending helps road managers decide on road repairs. The paper focuses on modeling changes in the longitudinal unevenness parameter using various degradation functions. The aim of the research is to create an optimal degradation model, which will serve as a basis for sensitivity analysis and determination of the optimal year of repair.

Keywords: Benefits; degradation model; modelling; pavement serviceability; road repair

The Experiences with utilization of BIM in railway infrastructure in Slovak Republic and Czech Republic

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Abstract

The process of projects creating and reporting is known as BIM (Building Information Modelling). It is defined as a current trend in the field of building industry and architecture. The development of this process has its beginnings in the 21st century. Since 2008 there has been a meaningful progress especially thanks to academic writings discussing this theme in more details. Knowledgeability has rapidly increased since then. BIM started to be implemented in the railway infrastructure constructions primarily in highly-developed countries such as Great Britain, France or Sweden approximately since 2013. In the Slovak Republic this process is not that well-known for most people working in this field. The aim of the article is to analyse knowledge about BIM and its usage in the Slovak Republic. The research method used is the questionnaire distributed among professionals working in the Civil Service companies, in the projective and building field of the railway infrastructure. The results of questionnaires show that only 29% of respondents were able to answer the question correctly, what is BIM. The research results enabled to identify the fields in which support is needed. This support can be done using various construction models and processes for formalization and coalescence of informational modelling of the railway infrastructure buildings. Within the introductory steps of a research solving that deals with a multi-dimensional model of the railway lifecycle, a 5D BIM sample model of the railway is created. Using this model the needed preliminary parameters of the project proposal and report are defined. Finally, requested outputs and their effective usage are defined, as well.

Keywords: BIM; railway; infrastructure; design

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Recognizing the temperature effect on the measurements results of the corrosion risk of plain and stainless reinforcement by the galvanostatic method

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Abstract

Tests of used reinforced concrete structures by non-destructive methods are performed in natural, current environmental conditions. These conditions are constantly changing, especially the daily and annual changes in temperature and humidity can be large. Such changes may have a significant impact on the values of measurements performed with electrochemical methods, especially on exposed elements of hydrotechnical, road, rail or power lines. The article presents tests performed with the semi-destructive electrochemical polarizing method of galvanostatic pulse on specimens in the laboratory in reference to results of tests obtained on real elements. Three parameters were measured: stationary potential of the reinforcement, concrete cover resistivity and corrosion current density as a function of temperature. Based on the obtained results, a clear influence of the ambient temperature on the values of the measured parameters was found.

Keywords: diagnostics of reinforced concrete; semi-destructive galvanostatic pulse method; environment conditions; temperature impact; reinforced concrete specimen

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Color durability of pigmented slurry surfacing after artificial aging tests simulating weathering and traffic

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Abstract

In the new vision of complete street, the use of colored pavements has been promoted in recent years to improve road user safety and to enhance the reorganization and aesthetic of the urban environment. But, besides several benefits these pavements undergo environmentally and traffic induced changes in appearance, faster than the traditional ones, a few months after installation. Thus, the laboratory-scale investigation analyzed the color durability of pigmented slurry seals, which were prepared using a clear synthetic emulsion and mineral pigments, subject to different artificial accelerated aging procedures. They simulated the exposition to sunlight at high temperature (QUV weathering tester), the aggression of chemical products (salt brine bath) used for winter maintenance operations and the dynamic actions of vehicle tires (loaded wheel tester). The analyses of color change measured with a spectrophotometer highlighted the extreme sensitivity of pigmented thin surfacing to physical and mechanical stresses. Specifically, the thermal and photo-oxidation of the binder film induced by the UV exposure at high temperature and its wear caused by the dynamic passage of rubber tire produced a large supra-threshold color difference on the samples' surface. These results suggest how a correct mix-design, both in the materials choice and ingredients dosage, should be properly calibrated on the basis of the pavement end-use and of the prevailing climatic conditions to ensure color consistency throughout the pavement lifetime.

Keywords: Colored pavements; Clear binder; Synthetic emulsion; Loaded wheel tester; Accelerated weathering; UV radiation

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CFD Modelling of High-Pressure Water Mist System in Road Tunnels

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Abstract

Fire safety is an inherent part during the road tunnel design. As road tunnels pose an important part of road public infrastructure, their endangering by fire may cause significant life, material or traffic costs. Hence are the fire safety systems in road tunnels under constant development and CFD tunnel fire models are used increasingly as an advanced tool during this process. This paper deals with modelling high-pressure water mist system which is still considered as a latter-day firefighting method in road tunnels. Scenarios created in Fire Dynamics Simulator vary in water mist system operating pressure and nozzle lay-out by constant longitudinal velocity 2 m/s in case of 15 MW small truck fire. The analysis of how these variable inputs effect the simulation results is the main aim of the paper focusing on heat flux and air temperature as main water mist fire suppression parameters. Besides, smoke layer height is monitored as essential parameter in solving the problem of evacuation and fire brigade intervention by road tunnel fires. Obtained data cover expected results in sufficient measure and provide foundation of CFD tunnel fire modelling application and further research in this field.

Keywords: CFD fire model; road tunnel fire; high-pressure water mist; tunnel fire suppression

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Design and optimization of photovoltaic systems in a parking garage - a case study

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Abstract

This paper deals with the design of photovoltaic (PV) systems in the roof plane of a parking garage for passenger cars. The selected type of PV system is optimized in terms of maximum efficiency of electricity production. A model solution for a parking house is being located on the outskirts of Žilina. The facade and roof of the parking house is without external shading by the surrounding buildings and vegetation. PV technology is located on the flat roof of the garage house. The optimization of the layout and inclination of the photovoltaic panels was performed in several variants. The energy produced is stored in batteries, which are located in the engine room. It is situated on the roof of the garage house above the charging stations of passenger cars, which are at the level of the 1st floor. In terms of economic efficiency, the optimal solution of PV technology from the analyzed variants for the climatic conditions of the Žilina locality was assessed. By economic analysis, we found that by installing PV panels, we can ensure the production of electricity for 6 charging stations and cover energy consumption related to the operation of the building.

Keywords: photovoltaic panels, solar energy, electricity, efficiency

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Reducing emissions produced by road transport and small heat sources

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Abstract

The article deals with the possibilities of reducing emissions, especially particulate matter. Nowadays, this is a particularly topical issue that car and heat source manufacturers will have to deal with in a relatively short time. Considerable attention is paid in the article to the capture of PM in the exhaust gases. Combining the idea of greener fuels with PM capture opens up opportunities for significantly reducing emissions to air. In the experimental part of this article were performed calculations of the production of PM in the model village from heat sources for heating family houses and the production of PM from cars. Along with these calculations, electrostatic precipitators were designed for the given equipment, on the basis of which calculations of the theoretical capture of PM from these sources were performed.

Keywords:emission production, biofuels, indirect emissions, electrostatic precipitators, road transport

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Experimental and FEM analysis of innovative bridge design

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Abstract

Bridges with embedded continuous shear connectors are getting more and more being used as a solution for the question of short-span bridges. They bring advantages such as low construction height – which can be helpful in reconstructions; easy construction process due to the prefabrication and overall effectivity of the beams with such cross-sections. At Technical University of Košice, Faculty of Civil Engineering several types of the connectors have been designed and tested. In this article, one of them is presented. Its geometry as well as geometry of the beam; analytical study; the tests performed at Laboratory of Excellent Research and FEM analysis and briefly described.

Keywords: composite bridge; continuous shear connector; FEM; steel-conrete;

Developing a Tool for Environmental Impact Assessment of Planned Activities and Transport Infrastructure Facilities

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Abstract

An adoption of national standards with assessment criteria and environmental impact indicators for road transport infrastructure elements made it possible to most effectively conduct environmental expertise in transport domain and determine potential environmental consequences in the process of preparing an environmental impact assessment (EIA) report. To give the EIA the Leopold matrix as a method to identify harmful implications for environment is used. This method becomes more complex, the more activities and environmental characteristics are indicated in the matrix. Road transport is an intense source of pollution for the atmosphere, territories and water areas adjacent to highways. For road construction the environmental characteristics are numerous and the estimation process becomes confusing even for experts. As the result of co-operative efforts of a state agency, developers and experts in EIA, road construction and project management a special web application for comprehensive estimating has been developed, tried and tested within the project of H-31 public highway reconstruction. It's been proved the facilitation for the processes of selecting the matrix components, filling it up with expert estimates, calculating the resulting indicators, identifying the most sensitive to changes elements of the environment and, finally, preparing the reporting documents for the supervisory state agency. The paper briefly describes the functionality of the developed online service, the methodology used for assessing the impact of planned activities and transport infrastructure facilities on the environment, as well as other challenges, that depend, inter alia, on public participation, scientific community comments and authority's support.

Keywords: Environmental Impact Assessment; Leopold Matrix; transport infrastructure facilities; road constuction; ecology

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Assessment of Traffic Noise Near Schools in a Developing Country

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Abstract

Schools are one of the land uses that are sensitive to traffic noise. While schools must be silent zones, many are located in urban areas and are exposed to high noise levels. In this study, an assessment of traffic noise around multiple schools in the city of Doha, Qatar was conducted during school hours. The results indicated that the noise is positively correlated with the traffic volume around the schools, indicating that locations with higher traffic volumes tend to have higher noise. The results also showed that the noise levels exceed the reference value of 53 dBA according to the World Health Organization. Furthermore, the measured noise levels exceeded the Qatar local standards for residential area and public corporation day-time noise level (55 dBA). To address this problem, several solutions were recommended.

Keywords: traffic noise; silence zones; noise pollution; annoyance; environmental noise

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Fire safety of an over ground car park building – model solution

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Abstract

Development of the automotive industry technologies increase the risk of fire in car parks and charging stations. The material used in the interior compartment as well as the volume of fuel in their tanks is highly flammable. There is an intense temperature development with the danger of fuel explosion and the spread of fire to the surroundings, when they burn. The analysis of the conditions, course and also consequences of the fire is the basis of current fire engineering.
The paper will analyze the intensity of thermal stress of the load-bearing structures of a multi-storey car park depending on the expected intervention of firefighters in accordance with the legislation requirements in the Slovak Republic and foreign countries in the Europe. In model solution will be analyzed non-combustible and mixed construction units.

Keywords: fire safety; FDS simulation; open car park; fire

Pilot monitoring of the internal temperature and humidity in the historic building attic space

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Abstract

The study of historic trusses deals not only with research in terms of statics and constructions but also with the study of temperature and humidity conditions and the microclimate of the studied area. This is mainly influenced by the airflow in the space and the temperature distribution during different temperature periods. For a correct understanding of the microclimate in the investigated space, measurements of temperature and humidity are performed and their distribution in the space during various time records concerning not only the parameters of the investigated space but also the boundary conditions during the measured period. The evaluation of the parameters is in terms of the annual course and the typical winter and summer week.

Keywords: measumerent; attic space; temperature; humidity

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Study on distribution of longitudinal shear forces in composite beams with web openings

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Abstract

In the composite beam, significant share of longitudinal shear forces occurs at the interface of steel and concrete element. This article presents a parametric study focused on behaviour of shear flow along the composite beam with web openings. The composite member composes of concrete slab, castellated steel beam and bonding between these components. The study demonstrates, influence of the non-uniform arrangement of shear connectors on distribution of shear forces in elastic stage of flexural behaviour.

Keywords: Composite steel and concrete; beam with web openings; shear flow; flexural behaviour; shear studs

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Influence of aggressive environmental actions on bridge structures

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Abstract

Bridges represent important part of the roads and railways due to their key and strategy position in transportation infrastructure. During years of exploitation, several degradation processes and additional influences like increment of environmental load attack the bridge structures. Due to those effects, their durability and reliability are decreasing depending on time, which need to be observed during inspections to maintain public safety. This article brings information about influence of aggressive environment on bridges, especially corrosion, which negatively affect serviceability and remaining lifetime of structures, also with results of long-term experimental measurements corrosion phenomena.

Keywords: corrosion; aggressive environment; bridges; maintenance

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Indirect methods for determining the state of prestressing

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Abstract

The assessment of the resistance and remaining service life of precast prestressed concrete structures is becoming a crucial aspect of civil engineering. This fact is even more significant in the light of the first generation of precast prestressed concrete bridges' failures in northern Slovakia. Recently, the collapse of a footbridge in Spišská Nová Ves underlined the need for proper diagnostic and assessment of existing prestressed concrete structures in Slovakia and abroad as well. Problematic precast prestressed concrete bridges of the first generation have been in service for more than sixty years, and thus knowledge of the current state of prestressing is the base for later determination of their load-carrying capacity. Hence, the present paper aims to introduce an overview of the present-day knowledge of indirect destructive and non-destructive methods for determining the state of prestressing in existing structures. Finally, the pros and cons of the mentioned techniques are discussed and compared.

Keywords: Prestressing force; prestressed concrete bridges; assessment.

Optimization of Traffic Situation Using Roundabouts

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Abstract

Transport is one of the essential elements of critical infrastructure. It is necessary to solve the traffic jam problem and threaten life, health, and property. However, there are several places where these problems are. There is required to solve this problem. One of them is in the selected village in the Zlín Region, Czech Republic. There are two problem places where are frequently the accident. This paper aims to introduce this intersection and prepare the optimized. The paper is divided into few parts. Firstly, there will be a literature review in traffic and the implementation into the critical infrastructure. Secondly, there will be introduced the methods which will be used for this research. Next, there will be the central part of the paper – results. The results are suitable for supplementation with the figures. These figures will represent the current state of the traffic in the village and others with the problem places. The second part of the results will describe the optimized traffic situation by using roundabouts.

Keywords: Traffic; Simulation; Roundabouts; Optimization

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Research into effect of asphalt mixture aging on stiffness

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Abstract

The paper focuses on the research of the stiffness of asphalt mixtures exposed to short-term and long-term aging. Asphalt mixtures are exposed to this type of ageing during their production, laying and compaction and subsequently during service. The research was carried out on test samples of asphalt mixtures AC11 50/70 and AC11 PMB 45/80-75 for wearing course of asphalt pavements. The asphalt samples have been exposed to the effects of short-term and long-term ageing by the conditioning of loose mixture method. Subsequently, the stiffness modulus of asphalt mixtures at temperature 20 °C was determined by the IT-CY method according to EN 12697-26. The obtained results showed higher values of stiffness modulus for the mixture with paving grade bitumen 50/70. The largest difference in the stiffness modulus was recorded for origin asphalt mixtures. Furthermore, an increase in the mixture stiffness due to ageing was observed, more pronounced in the case of the mixture with the polymer modified bitumen PMB 45/80-75. Gradual ageing changes the properties of asphalt mixtures, which are essential for the durability of the road.

Keywords: Asphalt mixture; Short-term aging; Long-term aging; Stiffnes modulus

Vehicle response as a function of speed

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Abstract

Many parameters affect the dynamic behavior of the vehicle and structure interaction, such as weight, damping, stiffness, road irregularities. The number of vehicles on the roads has been increasing in recent decades, as has the speed of these vehicles. This article deals with the analysis of selected statistical characteristics of the vehicle response (records of accelerations at certain characteristic points) depending on the speed of vehicle movement. The response of the Tatra 815 vehicle when driving along an asphalt road is monitored. Probability distribution densities and distribution functions are also monitored.

Keywords: Root mean square; kinematical excitation; dynamic load; vehicle response

TOPIC 5: Management Science and Informatics in Transport

Reviewers

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Kernel Search for Overhead Wires Network Planning for Battery-assisted Trolleybuses

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Abstract

Battery-assisted trolleybus technology can be seen as a perspective solution to develop public transport in more environmental-friendly way. This paper deals with the heuristic approach to solve the problem of creating minimal required overhead wires network for battery-assisted trolleybuses. A mathematical programming model of the problem is presented. The problem is solved using the Kernel Search method. Kernel Search was historically proven to produce high-quality solutions in many optimization problems. We present results for multiple instances, starting with small problems up to real full-scale Žilina city network. Testing data was generated using simulation software (OptSim) from vehicle schedules provided by the public transport company in Žilina (DPMŽ) and map data from OpenStreetMap project. Heuristic results are compared with near-optimum results obtained by a mathematical programming solver.

Keywords: Kernel Search, mixed integer linear programming, battery-assisted trolleybus, road network, schedules, overhead contact lines, location on edges.

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The Use of the Art of War Ideas in the Strategic Decision-making of the Company

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Abstract

Globalization of markets, intense competition, the need for rapid innovation require managers to make quick and correct strategic decisions. The traditional process of strategic business planning is outdated and inefficient. The Art of War provides guidance on making correct and quick strategic decisions for managers. The Art of War by Sun T´zu is the oldest surviving work on military strategy. The benefit of the work lies in a clear and comprehensive method combining political and economic strategy, rules of team building and business competition. Effective methodology for making strategic decisions will be created as a combination of the following: focus of strategic decisions on solving problems, ideas of the Art of War and selected methods of decision making.
Strategic and tactical excellence is essential for success of a company. Every company must have a quality strategy and effective principles for its implementation. Such principles are provided to managers by the Art of War. The article deals with possibilities of implementing the ideas of the Art of War into strategic decision-making in companies. By implementing them correctly, managers will ensure prosperity both of their companies and employees.

Keywords: Art of War; strategic decision; method; strategy; manager;

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The comparison of digitalization of Slovak Airports within the digital transformation of European Union countries

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Abstract

The area of digital transformation in the airport operation environment represents the implementation of new technological solutions, which leads to a reduction in operating costs and maximizing the efficiency of all processes. Due to globalization, there is a growing interest in air transport, so individual airports and airlines are forced to use their capacities as much as possible, which can be significantly lightened by the use of the latest technological solutions. The most developed countries have already introduced digital innovations at their airports, and this step has proved to be extremely beneficial for all stakeholders. The aim of the paper is to point out the integration of digital technology into the field of airport transport within Slovak airports. For the efficient operation of airlines, increased competitiveness and passenger satisfaction, it will be necessary to introduce digital innovations at Slovak airports in the future. The paper focuses on the comparison of selected Slovak airports with leaders in the field of digitalization, determined on the basis of the analysis of selected digitalization indices.

Keywords: Digital technologies, Digital transformation, Airport 4.0

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Detection of vowel segments in noise with ImageNet neural network architectures

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Abstract

In this article we report on experiments on detection of vowel segments in speech with additive noise. Deep neural networks have become the key algorithm in the majority of modern machine learning solutions. We investigate the performance of four ImageNet convolutional neural network (CNN) architectures. Usage of image processing CNNs is enabled by transforming the speech segments into spectrograms before the classification takes place. We perform experiments on TIMIT speech dataset and noise from datasets MAVD and ESC-50. The accuracy of individual architectures did not vary significantly among architectures on the dataset with added noise. However, accuracy of various architectures did differ significantly when applied to noise with absent speech.

Keywords: Imagenet; deep neural network; vowel segments; additive noise; car audio systems

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Anomaly detection using Autoencoders and Deep Convolution Generative Adversarial Networks

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Abstract

The current trend in transport (road, railway, unmanned aerial vehicle) introduces autonomous transport means. As the autonomy of vehicles increases, situations arise for which the models have not been trained, which increases the safety risk. Therefore, we propose systems that would detect such "anomaly" situations. We designed two anomaly detectors - an Adversarial Autoencoder (AAE) and a Deep Convolutional Generative Adversarial Networks (DCGAN). These models are build up on models from resources Autoencoders (2020) and Deep (2020). Networks are trained using picture datasets MNIST, Fashion-MNIST and CIFAR10.
With DCGAN network, cumulative and reverse cumulative distribution functions are used to find an optimal decision threshold. In the case of autoencoder networks – an optimal number of latent variables is found using reconstruction error ratio function. Then, in both cases (AAE and DCGAN network), cumulative and reverse cumulative distribution functions are used to find an optimal decision threshold. Finally, influence of image picture complexity on the anomaly detection is discussed. We got best results with anomaly detectors trained on the less complex datasets comparing to test datasets. For both detectors trained on the simplest database MNIST, under a given anomaly expectation probability equal to 0.5, we reached the anomaly detection error 0.08% (AAE) and 1.89% (DCGAN).

Keywords: anomaly detection; autoencoder; DCGAN

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Grouping Genetic Algorithm (GGA) for Electric Bus Fleet Scheduling

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Abstract

The use of electric vehicles in the mobility of people is on the rise. This trend naturally is reflected in the public transport systems as well and presents a potential for clean transport in the cities with the reduction of operational costs for the providers of public transport systems. In this paper, we focus on one of the problems when introducing a fleet of electric buses to the city transport system, specifically the electric bus fleet scheduling problem. In this problem, an assignment of available electric buses to the service trips as well as the charging process and charging scheduling is addressed in order to minimize the number of used electric buses. The specifics of the electric buses such as the restricted driving range and long charging time need to be considered. The used type of charging is the opportunity charging, where the chargers are located at different places of the road network. To solve the problem, we propose a heuristic approach based on the grouping genetic algorithm, which utilizes the grouping character of the scheduling problem. The algorithm was tested on the datasets generated from the public transport system in the city of Žilina and compared to the results obtained by solving the previously presented mathematical model.

Keywords: Electric bus scheduling; Transportation system planning; Genetic algorithm; Heuristic approach

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Outlines of Vehicular Ad-Hoc networks

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Abstract

Due to a large number of vehicles, traffic accidents, road congestion, and fuel consumption, pollution has become a serious global issue. In the past years, autonomous and self-configured Vehicular Ad-Hoc Network (VANET) has become the key research topic due to the increasing demand for road safety and management. As a result, VANET technologies are applied to the different areas of Intelligent Transportation Systems (ITS) to regulate these problems and make traffic safer. This work aims to provide an overview of vehicular ad hoc networks and to present the aspects related to this field to help researchers and developers to understand the main features of VANET technology. We mainly focus on communication technology research, protocol usage and data routing. The paper also represents the main profiles and purposes of VANET technology and provides a security outline of this technology.

Keywords: VANET; DSRC; WAVE; V2V; Intelligent Transportation System; 802.11; Ad-Hoc Networks

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Developing a Prototype Platform To Manage Intelligent Communication Systems in Intermodal Transport

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Abstract

Due to the collective attention towards global environmental challenges, the rise in fuel prices, the risk of drivers' shortage, and the new legal developments limiting the hours of service on frequently congested roads, developing efficient and effective intermodal freight transport networks is becoming an increasingly important success factor for companies to manage their supply chains. However, many factors hinder the smooth implementation of intermodal systems, such as the high number of operators to be involved, the duplication of handling activities and transit times at the intersection of each transport mode, and the lack of information sharing among the different transport modes and companies. To overcome such barriers, Intelligent Communication Systems (ICS) have increasingly been applied to activities within the nodes (warehouses, transit points) and arches (transport routes) of distribution networks, providing several benefits, such as real-time visibility and tracking, more precise, reliable and efficient data collection, and document exchange. One of the key elements that can guarantee the successful design and implementation of an intermodal transport system is the integration of the various systems and actors involved along the process. This paper aims to contribute to this issue by presenting some of the results of the "ITS Italy 2020" project, an applied research initiative financed by the Italian Government to foster the diffusion of Intelligent Transport Systems (ITS). More specifically, we illustrate a prototype solution, based on a software that allows managing and monitoring freight transport along an intermodal network, thus overcoming some barriers currently limiting intermodal transport implementation. The prototype can communicate with devices and sensors put on board the vehicle or load, and track sensors positioned along the road. The solution integrates all the other systems involved by collecting and publishing information, managing events, and sending messages.

Keywords: Intelligent Transport Systems; Intelligent Communication Systems; Intermodal Transport; Logistics; Platform; Prototype

Proposal of the traffic service on the Žilina – Rajec railway line by using the innovative methods

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Abstract

Nowadays, there is a trend that creates individual car transport, which creates environmental burdens and congestion, which is reflected in the time loss of all transport participants. It is therefore important to develop public passenger transport and support alternative transport modes that are environmentally friendly. The development of electromobility and creation of integrated passenger transport systems are opportunities to find new possibilities to improve public passenger transport and the exchange of rail passenger transport. The article deals with the use of new progressive scientific methods in the context of improving the quality of passenger rail transport and improving transport services. First, the main basic principles of transport services and passenger rail transport are defined, followed by a review of the literature, which is followed by the proposed scientific principles and context. Secondly, the practical application of the proposed issue is demonstrated on the Žilina – Rajec railway line.

Keywords: Traffic potential; Traffic service; Scientific methods; Timetable

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Investigation of Opinions on the Acceptance of Autonomous Railway Vehicles in Slovakia

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Abstract

The future of transportation is dramatically changing, and autonomous vehicles will play a key role in all means of transportation. In response to this challenge, the Drive2TheFuture project was developed. This project addresses the future of transportation and implementation of autonomous vehicles in road, maritime, air and rail transport. The authors of this article focus on railway transportation, since railway system are very important factors underpinning the robust economy of a country and the autonomous transport is the most realistic in the railway transport. Transporting people and goods by the train is one of the cheapest, quickest, and, also cheapest methods. The paper assesses the opinions on the acceptance of autonomous vehicles in railway transport in Slovakia. The aim is to obtain new knowledge about this issue and also determine the current state of preferences of the people in Slovak Republic regarding to use new modernized form of railway transport (with autonomous vehicle). To fulfil this goal methods of obtaining and gathering information were used, such as the method of document analysis (theoretical knowledge), the method of interpretation and the questionnaire technique. Furthermore, information processing methods were used, such as the method of quantitative evaluation, methods of statistical and analytical information processing and the method of databases. For the problem solving were used method of induction, deduction, synthesis, abstraction, and modelling. The article is divided into 6 section. In the Introduction is the basic context described. Objective and Methodology stated the aim and methods which will be used for fulfilling the goal. The current state of dealing with the issue described in detail the development of railway transportation and the problem of acceptation of autonomous vehicle. Two sections deal with findings, evaluation, and discussion. In conclusion are summarize facts and opinions of authors. List of literature is part of this article.

Keywords: acceptation; autonomous vehicle; opinion; railway; Slovak Republic.

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Simulation-based methods to support the real-time management of railways nodes

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Abstract

The quality of operative management of railway nodes is crucial for the effective operation of whole railway system. Current disposition systems often do not provide sufficient support for dispatchers in their decision-making. This paper describes a design proposal of a real-time decision support system based on the simulation model. Due to the properties of employed simulation model (ability to perform experiments and verify solution proposals, capability of obtaining partial results, graphical representation of the results etc.), the proposed system is suitable for decision-making support of dispatchers in railway node, as well as for new dispatchers training. The basis of the proposed system will be formed by a simulation model created in Villon simulation software, which enables creation of highly detailed microscopic simulation models reflecting many important aspects of the operation, including personnel and other types of resources. Necessary adjustments and improvements of the simulation software (e.g. introduction of sophisticated resource selection algorithms for modeling of dispatcher's decision, thus reducing the dependence on the human factor) are discussed as well.

Keywords: : Simulation; optimization; railways; decision support

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A matrix approach to detect temporal behavioral patterns at electric vehicle charging stations

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Abstract

Based on the electric vehicle (EV) arrival times and the duration of EV connection to the charging station, we identify charging patterns and derive groups of charging stations with similar charging patterns applying two approaches. The ruled based approach derives the charging patterns by specifying a set of time intervals and a threshold value. In the second approach, we combine the modified l-p norm (as a matrix dissimilarity measure) with hierarchical clustering and apply them to automatically identify charging patterns and groups of charging stations associated with such patterns. A dataset collected in a large network of public charging stations is used to test both approaches. Using both methods, we derived charging patterns. The first, rule-based approach, performed well at deriving predefined patterns and the latter, hierarchical clustering, showed the capability of delivering unexpected charging patterns.

Keywords: electromobility, clustering, charging stations, data analysis;

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Impact of the concept Smart City on public transport

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Abstract

Public transport is a key element in cities to meet the transport needs of the population. The current trend in Slovakia shows the preference of individual transport over public transport. However, cities are limited by the possibility of constantly building transport infrastructure. The trend towards building smart cities can positively affect different areas of the city, including transport. The aim of the article is to highlight the possibilities of influence of the municipality to ensure the transport needs of the city in accordance with the smart city concept. It is possible to make public transport more attractive by choosing the right carrier to accommodate other elements of the smart city. In this way, the city can achieve a higher use of public transport in the city by the travelling public. Reducing the share of individual transport will improve the air in the city and the overall quality of life of the population.

Keywords: Smart City; Smart Transport; Management; Municipality management; transport;

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Effect of indexes on DML operations

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Abstract

Transport information systems store and manage an increasing amount of data. For this purpose, database systems are used, which can significantly increase the execution time of data selection queries by creating index structures. However, in cases of frequent additions, changes, or deletions of data, the performance slows down due to the editing of the created corresponding indexes. This paper deals with the effect of the number of indexes on the performance of insert, update, and delete operations that have been observed in our practical experiments in Oracle.

Keywords: Database System; Index; DML operations; Bikesharing.

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Intelligent Transportation Systems in a Developing Country: Benefits and Challenges of Implementation

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Abstract

The increasing need for improving mobility and road safety has led developing countries to make significant changes in their infrastructure, especially when it comes to the modernization of the transport infrastructure. The purpose of this paper is to present the experience and challenges of the implementation of intelligent transportation systems (ITS) in Qatar, a developing country in the Middle East. ITS has been developed in the country and currently in the implementation stage. A detailed review of existing and proposed ITS technologies is provided. Many challenges were identified to achieve a fully functional, practical, and integratable ITS network. Some of these challenges include coordination with different stakeholders, adopting different countries' ITS systems, keeping up with the technology, integration with existing systems, and budget constraints. The paper provides lessons learned that can benefit other developing countries going through the same transition.

Keywords: ITS implementation; ITS network; ITS technologies; traffic congestion; traffic safety

The Evolution of Connectivity in Sig-T Modeling. The Case of the Spatial Data Infrastructure of Andalusia

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Department of Physical Geography and Regional Geographical Analysis

Abstract

Connectivity is considered a crucial condition in vector network modeling, since route optimization analysis or geomarketing analyses could not be performed without it, when accessibility is among their parameters. Andalusia's spatial data infrastructure got its start in 1990, with the creation of the Andalusian Institute of Cartography. The first public product of a vector cartography was the 1:400,000 digital map of Andalusia. Several series have been released at a scale of 1: 100,000 ever since, with different connectivity conditions that have required subsequent adjustments by transport networks researchers. The development of digital cartographic sources should not only result in an improvement in precision, but also in their operational capacity. This article analyzes the quality of these products based on their connectivity capacity with the intention of creating rules for modeling that ensure the ability to perform network analysis tasks using public and affordable spatial data infrastructures.

Keywords: GIS-T, Network Analysis Spatial Data Infrastructure, Connectivity, Topology

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Fuzzy Inference System for Congestion Index Estimation Based on Speed Probability Distributions

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Abstract

The increased development of the urban areas consequently results in a larger number of vehicles on the road network, which inevitably leads to traffic congestion, especially in the rush hours. Intelligent transport systems solutions present the applications that can be useful in detecting and dealing with the problems that are related to congestion. This paper presents a method for the congestion index estimation using the speed transition matrix and the corresponding center of mass. The congestion index is estimated using a Fuzzy Inference System optimized by adopting the Genetic Algorithm. In this paper, the large real-world Global Navigation Satellite System data are used to evaluate the proposed method for the traffic state estimation of most relevant road segments in the largest city in Croatia, the City of Zagreb. The validation of results is performed using the domain knowledge presented in the Highway Capacity Manual, which resulted in the model's precision of 94.6%. The result indicates a possible application of the method for the congestion estimation in urban centers.

Keywords: traffic congestion index; speed frequency distribution; speed transition matrix; GNSS data; center of mass

TOPIC 6: Safety and Security Engineering in Transport Subtopics

Reviewers

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Marek	Leszczyński		

Authors are responsible for language and content of their abstracts.

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Adapting The Public Transport System to the COVID-19 Challenge, Ensuring its Sustainability

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Abstract

Current article is developed in the frame of the postdoctoral project: "Adapting the public transport system to the COVID-19 challenge, ensuring its sustainability" under activity 1.1.1.2 "Post-doctoral Research Aid" of the Specific Objective 1.1.1 "To increase the research and innovative capacity of scientific institutions of Latvia and the ability to attract external financing, investing in human resources and infrastructure" of the Operational Programme "Growth and Employment". That is why the primary goal here is to develop post-doctorate skills as a new scientist and to increase post-doctorate scientific capacity, ensuring the possibilities for starting serious career in scientific institutions. The secondary goal of current article is to disseminate the information about the start of current project and about the scientific plans of the post-doctorate to develop a system solution for keeping public transport system in sustainable and safe position by adapting it to the COVID-19 challenge, ensuring its sustainability. The first step of adapting the public transport system to the COVID-19 challenge, ensuring its sustainability is given here. The recommendations and measures done during first wave of coronavirus are structured and described. There are shown also the most common mistakes (in an unstable epidemiological situation) made while using a transport. Recommendations to reduce the negative effect of coronavirus COVID-19 in transport are given. Advanced practices and last achievements for controlling coronavirus COVID-19 to reduce its negative effect in public transport system are discussed.

Keywords: advanced practices; covid-19; public transport system; safety; sustainability

Development of System Solution for Public Transport System Sustainability and Adapting it to the Challenge of COVID-19

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Abstract

The main goal of current article is to offer a system solution for keeping public transport system in sustainable and safe position by adapting it to the COVID-19 challenge, ensuring its sustainability.The introduction of the paper deals with the analysis of the public transport system in 2020 under the unclear epidemiological situation in the World by spread of Covid-19. Second chapter shows the beginning of the process of planning of system solution for adapting the public transport system to the challenge of Covid-19. Author deals with own vision of such solution. In third chapter author shows the vision of the system solution for the control of public transport system to ensure its sustainability taking into account also epidemiological situation. Last chapter shows some ideas, advanced practices and last achievements for public transport system sustainability.

Keywords: advanced practices; covid-19; public transport system; safety; sustainability; system solution

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Facade Insulation from Wood-Fiber Boards in The Burning Process

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Abstract

The article focuses on the study of wood-fiber insulation intended for facade insulation of buildings, and on monitoring the properties of selected insulation materials under thermal load. Two types of insulation materials were selected - plain fiberboard, used as an underlay for plasters, and fiberboard with bitumen, which is used mainly for ventilated facades. The selected material and its preparation for the test itself are described in the methods. The thermal analysis used and its measurement principle are further defined. The main objective was to evaluate the recorded measurements based on three curves - the TG, DTG, and DSC curves. The curves are determinative when examining the application of the thermal load and subsequent material comparison. The outputs from the measurements are presented in the form of charts and tables. By means of comparing the results, the Steico Black insulating material seems to be safer than Steico Protect.

Keywords: Thermal analysis, fiberboard, insulating material, TG, DTG, DSC;

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Scenario Analysis of the Impact of a Power Outage to the Transport Infrastructure in The Selected Area

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Abstract

Transport infrastructure is an extensive system consisting of several elements, which ensures national and international transport of people and goods. All types of transport are used within the transport infrastructure on the territory of Slovakia. The transport system of the Slovak Republic consists of road, rail, water, and air transport. Quality and functional transport infrastructure is a prerequisite for the rapid development of regions, which supports the development of the state. The importance of transport infrastructure is also pointed out by Act 45 (2011) on critical infrastructure. The Act identifies in its annex the transport sector, including the relevant subsectors, which are made up of individual types of transport. Not only in Slovakia, but also abroad, transport infrastructure is perceived as a very important component of a functioning state. Researchers look at critical infrastructure sectors in terms of their relevance to a functioning society. Therefore, it is important to address two questions, firstly: "How can a power outage affect transport infrastructure?" And secondly, "How is society (citizen, municipality/city, region, and state) affected by a dysfunctional transport infrastructure?" requires the application of scenario technology, which can comprehensively cover the issues addressed and provide adequate solutions.

Keywords: transport, infrastructure, scenario

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Methodical Procedure for Creating a New Methodology for Assessing the Resilience of Transport Infrastructure

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Abstract

An important part of risk assessment is the assessment of resilience. Resilience assessment leads to increased safety of the evaluated element. Resilience can be understood in different ways. In general, resilience is the ability of an element to resist, absorb, and adapt to adverse events. To unify the understanding of the area of resilience, it is appropriate to develop a uniform methodology for the assessment of resilience. Such a methodology can unify input and output information, thus facilitating resilience assessment. Transport and transport infrastructure are complicated technical systems that require a specific approach. This article aims to analyse the appropriate methodologies used in the assessment of resilience and to present a proposal for a uniform methodology for the assessment of resilience specific to the transport sector.

Keywords: assessing; methodology; resilience; transport infrastructure

Specifics of the Agile Approach and Methods in Project Management and its Use in Transport

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Abstract

The most commonly used tool for implementing changes in the enterprise, are projects. The success of projects, whether in the introduction of products, new technologies, or the expansion of production capacity, contributes to increasing the competitiveness of the enterprise. Conversely, the failure of projects can lead to a decline in performance, large financial losses, or even a threat to the existence of the enterprise, especially in the case of large investment projects. Projects using new technologies have to face the fact that this technology will not be able to meet expectations. Highly complex projects face the problem of accurate estimation of time and costs, and even the smallest and simplest projects have a certain element of risk, so it is necessary to find a suitable approach to managing projects with regard to risks in all areas and therefore also in transport. The aim of the article is to point out the possibilities and ways to use an agile approach in project management in transport, including a comparison of selected methods.

Keywords: project; project management; agile approach; transport; risk management.

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Effect of Business Risks on the Business Future by Czech and Slovak SMEs in the Segment Transport and Services.

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Abstract

The aim of the article was to identify important sources of business risks on the business future in the service and transport sector separately in Czech and Slovak entrepreneurs. The case study was carried out on a sample of 240 small and medium-sized enterprises (SMEs). Linear regression models was applied to verify causal relationships. The business risk are define as market, financial, personal, legal and operational risk. The business future is define as a risk of bankruptcy for company within 5 years. The results show disparities according to the nationality of the respondent. The nationality of the entrepreneur is a significant factor in the perception of the impact of business risk on the future of business. Management of both business risks have a positive impact on the business future of the company according to the Slovak entrepreneurs in the service and transport sector. Management of the operational risk are the most important indicator with a positive impact on the business future of the company according to the Czech entrepreneurs in the service and transport sector.

Keywords: Business future; SMEs; business risk; business environment; service; transport.

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Traffic Accident Monitoring Information System of the Selected Region

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Abstract

Road infrastructure is an integral part of every individual, whether as a driver of a motor vehicle, a pedestrian or a cyclist. Road safety therefore directly affects life, health, property as well as the environment of society. The intensity of road traffic is growing from year to year, and the analysis of the road network, together with safety issues, is coming to the fore. Traffic accidents are on the rise and therefore providing a high level of road safety is an essential part of road traffic. The article described the issue of accident monitoring of the selected region as a web portal that communicates with the database and displays specific traffic accidents through chart background. The information system allocates data based on predefined access rights of individual users. The analysis and comparison of information systems focused on the mapping of traffic accidents led to the creation of an interactive map of traffic accidents. The main goal is to point out the current situation of road traffic, to provide statistical outputs to police forces and entities ensuring road safety, as well as to bring the safety situation on the road closer to the public.

Keywords: traffic accidents, information system, interactive map, safety

Reducing Expert's Estimations Subjectivity in Physical Protection Systems Parameters of Monitoring Traffic Center with Normal Distribution

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Abstract

The article describes and explains on examples, technique that can be used to reduce the subjectivity measure for estimates made by experts. The article focuses on the establishing values of the parameters occurring in physical protection systems of monitoring traffic center (response time of security and rescue services). The parameters used in the article are random variables with a normal distribution. Therefore, in here presented examples, it is possible to use technique based on Bayesian estimator to improve already formulated primal estimates. In addition to examples, the article also contains parts from a software solution that can be used for various estimations on the input according to practical requirements.

Keywords: physical protection systems; normal distribution; Bayesian estimator

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Evaluation of Hazard Perception Skills of Young Drivers

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Abstract

This study should point out valuable information about the process of hazard perception of (young) drivers and evaluate their hazard-perception skills to find out how well-marked this ability really is, and how they are thinking about their own hazard perception skills. For this, an eye-tracking system was used to record the gaze behavior of the drivers. In Addition, a system based on a data logger and sensors was developed to capture and log the relevant data from the vehicle. By tapping the vehicles CAN-Bus, the needed parameters (e.g. Position of accelerator, brake and clutch pedal, steering wheel angle) were gained through reverse engineering of the vehicles CAN stream. At the end, all captured data is synchronized and overlaid in the eye-tracking-video. The complete system of data-logger and sensors was integrated persistently in a driving school car. Due to the fact that all data was captured in real time traffic, every analyzed situation is unique and can't be compared to another situation. Therefore, it's not possible to make a statistical evaluation. So, the results have to be described qualitatively. Summed up, only in 18 % of the analyzed situations the hazard perception skills are adequate or the same as they were taught at the driving school just a few months ago. Faced with the videos after the lesson, the tested drivers downscaled the self-assessment of their driving skills by around 25 % on average. So, it can be shown that the hazard perception skills of young drivers are not at the sup-posed or teached level.

Keywords: Hazard perception; eye tracking; real time traffic; can bus reverse engineering

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Risk Management in Selected Public Passenger Transport During a Pandemic

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Abstract

The work concerns the important issue of the risk of contracting the COVID-19 infectious disease caused by the SARS-CoV-2 coronavirus in selected means of transport. Coronavirus, the risk of infection with it, and methods to limit its spread, are the main topic of almost every media every day. Therefore, it is important to raise the topic of occupational risk both at the workplaces serving selected means of passenger transport and the risk of infection for travelers. In the study, an attempt was made to assess the risk of being infected with the SARS-CoV-2 coronavirus at the service workplaces of selected means of passenger transport and among passengers of these means of transport using the Risk Score method. The research was conducted based on data resulting from generally accepted procedures in selected means of passenger transport and on the basis of expert interviews.
It has been proven that properly organized and implemented protective measures can reduce the risk of contracting coronavirus.

Keywords: coronavirus pandemic; passenger transport; risk; Risk Score method

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Scenarios Involving Accident-Damaged Electric Vehicles

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Abstract

Electrically propelled cars will play a major role on the streets, not only in the far, but also in the near future. In this work, an overview on the possible risks arising from electric vehicles is given that involves electrical, chemical and thermal hazards. Additionally, an analysis on different scenarios involving damaged electric vehicles, the involved parties, as well as their risk assessment in terms of hazard rating is presented. Furthermore, two scenarios are explained and addressed with more detail. With the derived risks of the battery and with possible crash scenarios presented, the still existing uncertainties for handling damaged electric vehicles are addressed, followed by a discussion on ways to overcome this problem.

Keywords: electromobility; batteries; lithium ion; electric vehicle; accident; rescue service; recycling

Use of the Method of Operational Analysis in the Framework of Technological Safety of Emergency Work

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Abstract

Rail crossings are unique in the world of transport and the intervention of members of the Fire and Rescue Corps is also unique in the event of an accident on them. The article describes the use of the method of operational analysis within the technological provision of rescue work of fire brigades according to the established scenario of an accident. Follow-up procedures are being assessed, which are applied to the situation requiring solutions and management, especially in terms of time. The calculation of a PERT network graph is applied in the article and its analysis by conversion to a deterministic model. The main goal of the article is to approach the complexity of the intervention activities of fire brigades in the event of accidents at level crossings. Use and application of operational analysis methods in accident scenarios contributes on the one hand to train firefighters and, on the other hand, to identify good technological practice in the event of accidents.

Keywords: road transport, railway transport, operational analysis, intervention activity

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Strategy Management of Telematics Systems in the Transport Sector with Regard to Safety

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Abstract

Transport has an impact on the daily lives of the population. Currently once more people use daily mode of transport on the roads. It is the increase of participants that creates a higher risk of crisis occurrence in transport. Security has long been one of the most felt human needs, and it is in transport that needs to be given particular attention. Different road systems can be used to increase safety. These include telematics systems. They are an important tool for traffic management and regulation, which ultimately affects safety itself. In the article, we focused on their use with a view to reducing the likelihood of crisis phenomena in transport. We focused on their positive impact in increasing the transport safety and flow. The use of these systems reduces the occurrence of crisis phenomena and, in the event of emerging crisis phenomena, contributes to a more effective solution.

Keywords: security, crisis phenomena, telematics systems, traffic.

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Validity of the Seveso II and III Directive in the EU

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Abstract

This article deals with the prevention of the major industrial accidents and its development during last decades. It summarizes especially the basic changes introduced in the Seveso framework during this development and based on the statistical data it estimates their influence on the development and quantity of the major industrial accidents. It offers the statistics and basic analysis of the industrial accidents that reflect the effort to reduce the quantity of the industrial accidents worldwide. Based on the investigations it presents the basic problems and gaps in the Seveso directive implemented in a particular country and shows the new challenges for adapting the laborious regulations in this area.

Keywords: Major Industrial Accidents, Accidents, Prevention, Statistics of Accidents, Seveso III, eMARS

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Logistics in the Process of Evacuation of the Population in the Finding of a Booby-Trapped Explosive System

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Abstract

Every day, emergencies endanger people who are at risk of injury and, in worse cases, death. It is even worse when another person is responsible for the loss of human life. In recent years, we have encountered attacks on places where a large number of people gather, such as concerts, shopping malls, or even Christmas markets. This work focuses on logistics in the process of evacuating the population when finding a booby-trapped explosive system that aims to injure as many people as possible. For better orientation, a model situation is created in the Zlin Malenovice Shopping Center, during which the routes of the IRS to the place of intervention and their dislocation are also outlined.
The work aims to point out the model situation of the attack in the Shopping Center Zlín Malenovice and the logistics of the IRS.

Keywords: Logistics; evacuation; integrated rescue system; booby-trapped explosive system

Increasing the Resilience of Transport Enterprises through the Implementation of Risk Management and Continuity Management

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Abstract

A society can't function optimally without ensuring the fluency of transport, whether from moving people through work to traveling around the world, which is important for overall productivity and sustainable development of society, as well as the transport of goods between countries too. The current pandemic situation has affected every environment of our life, and the accepted measures on its mitigate, it has also affected our freedom of movement. The effort to reduce the spread of the virus has forced countries to close their borders and thus affect our movement, which is a matter of course for us. The enterprises had to adapt to the accepted measures, which in a lot of cases led to the interruption of operations for several months. A lot of micro-enterprises, small and medium-sized enterprises (SMEs) have also disappeared, as the cost of maintaining unused operations was higher than the profits. In this context, is placed a great emphasis on the area of prevention, whereas incorporating risk management and crisis management connected with business continuity management (BCM) into enterprises be create a certain resilience of enterprises, in the case of the origin of negative phenomena, which affect enterprises.

Keywords: risk management; business continuity management; pandemic; transport; enterprises.

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Integrated Risk Management System in Transport

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Abstract

In connection with current trends in the field of transport enterprises, it is necessary to constantly improve processes in all areas of the organization. For this reason, many enterprises implement management systems in their internal structures. According to foreign studies, the main difficulties for managing risk in an integrated system are the lack of an internationally recognized standard that would provide a structured guide to risk management in an integrated management system. The goal of the article is to propose the concept of integrated risk management in the areas of service quality, safety and health at work and environmental protection using the PAS 99 standard for transport enterprises. Basic scientific methods like analysis and synthesis of the obtained data were used to meet the set goal. The results recorded in the article point to the need to create an individual guide to integrated risk management in transport enterprises. In the article, the authors point out the areas of risk integration for quality, environmental and occupational health and safety systems The main benefit of the article is to propose the concept of risk management in an integrated management system for transport companies in the European Union based on the analysis of researches data.

Keywords: Risk; risk managment; integrated management system; PAS;transport

Risk Assessment Using the FMEA method in the Organization of Running Events

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Abstract

It is characteristic of the current period that the importance of risk and the need to address it the importance of risk is becoming increasingly serious, whether from the point of view of the environment or individual processes in the organization. With increasing number of risks that organizations are facing, its complexity and interdependence are increasing as well. For a more effective assessment of process risks, it is possible to apply the Failure Mode and Effects Analysis (FMEA) method, which has application not only in the business sphere, but also in various organizations of public administration or self-government, sports and cultural organizations. The essence of this article is a suggestion to modify the procedure of FMEA method application for the conditions of organizing running events and assessment of the most severe risks in organizing the Rajec marathon, in order to increase the safety and quality of the event. The application of the FMEA method brings increased value to the process, so that responsible managers can assess possible human errors, propose measures to reduce risks and serve as a source of knowledge and lessons for the future implementation of processes. The benefit of the suggested solution is to facilitate the work of responsible employees in assessing the risks of processes in the field of organizing sports events, which will improve the quality and increase the safety of the overall process.

Keywords: risks; failure; risk assessment;FMEA method; prevention; running event;

Application of the PERT Method in Planning of Area Evacuation of Persons

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Abstract

Crisis situations usually come into our lives unexpectedly without a warning and therefore precise approaches are needed to protect the population as effectively as possible. An integral part of the process of managing any activity is the planning phase. The plan affects the overall quality of the project and its main task is to set the objectives of the activity (project) and the ways leading to their fulfillment. Methods of operational analysis form the basis for finding the optimal solution to the researched problem. They have a wide practical application in connection with time planning, storage, passenger transport, distribution of products, operation of public service systems and other tasks of an economic nature. The subject of the article is the introduction of a possibility of applying the network analysis method in the process of planning of an evacuation of people. The aim of the article is the application of the PERT method to the processes associated with crisis management and evacuation of the population, the practical use of the software tool MS Project, interpretation of results, and pointing out the possible use of network analysis methods in crisis planning situations.

Keywords: crisis planning, evacuation, transport security evacuation, network graph, PERT method.

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Assessment of Fenestration Security as Part of Railway Infrastructure

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Abstract

The safety of train stations can be affected by many internal and external threats. Train stations or stations in generally can be classified as soft targets. It can be assumed a potential target for many, especially terrorist attacks. In elevated number of railways stations, large glass surface as facades and stained-glass windows are presented. They present vulnerable part of construction, affected by various type of accidental loads (as blast and impact) in case of terrorist attacks. In this terrorist attack, the biggest cause of injuries and deaths are caused by debris from glass parts of structure. The paper is focused on the glass used in modern construction of train stations. Based on this, several methods of loading condition are described and the resistance of fenestration on such loads is assessed. The practical part of the paper is focused on two types of window systems and the resistance to dynamic loads was evaluated. The experimental testing was performed using a pendulum test. The results showed the resistance of selected types of windows without, as well as, with the use of security protective film. The paper also interprets possible glass failure under dynamic loading.

Keywords: fenestration; railway stations; soft target protection; security; terrorist attacks; resistance

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Development of test system for forensics investigation of collision between vehicle and pedestrian

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Abstract

The traffic accidents between vehicles and vulnerable road users have fatal consequences in the most cases. Despite the development of active and passive vehicle safety and significant progress in the use of autonomous systems, there is still a need to pay increased attention to these accidents. Investigating such accidents is not an easy task and in the most cases and it is a very time-consuming process, both in terms of time and in terms of the technique needed to perform deep investigation and potential verification of the accident scenario. The affordable and technically achievable test system which would be able to perform and reproduce accident scenarios is a kind of solution which will help forensics engineers to understand the physic of accident in more detail.

Keywords: pedestrian;traffic accident; testing, vehicle

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Economic Security of Public Transport Provider in a Three-Dimensional Model

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Abstract

Studying economic security of enterprises has important impacts on maintaining economic security of an individual, of a region, and of a nation. Enterprise is economically secure when it maintains its stability in business processes which the enterprise performs daily. Enterprise as a system naturally inclines to losing its stability, and therefore it is important to identify, analyze, and monitor various elements of this complex system. Quantitative measurement of the selected elements should be indicative of negative evolution within the business processes of enterprise. There are many approaches to assessing economic health of enterprise through financial ratios, performance indicators, controlling or auditing. Common approaches, however, serve rather to assess business value, productivity, budget discipline, or legal compliance. In the literature, there is still missing any general approach to assess economic security of enterprise, which would be based on monitoring system deviations from desirable evolution. We suggest a three-dimensional model of the core elements of economic security of enterprise. It is based on the need to monitor performance, costs, and financial ratios of enterprise, and to detect any deviations from the system's stable evolution. We use the dimensions of public transport providers' annual reports in combination with Ishikawa diagram methodology. Several non-financial elements form a dimension of current performance monitoring, cost reports items form the second dimension. Finally, financial ratios in the third dimension reflects more global and long-term view on business performance within the general model.

Keywords: economic security; public transport; Ishikawa diagram; indicator; enterprise; transport provider

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The Permeable Performance Testing of the Level Intersection – Case Study

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Abstract

The article deals with the assessment of the permeable performance of a level intersection. The case study uses the results of our own directional intersection traffic survey, supported by the outputs of the national traffic census and forecasts of traffic development in the given road section. The assessment of the design of the intersection solution is performed alternatively without a motorway section and after its commissioning. The main goal of case study is to analyze the traffic characteristics of the original level of uncontrolled intersection and to assess the proposal of a new transport organization with the intention to increase the safety and fluidity of traffic as the main prerequisite for increasing the resilience of the intersection.

Keywords: Permeable performance; level intersection; transport safety

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Analysis of Traffic Accidents in Selected Period in the Žilina Region and proposal of Security Measures

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Abstract

The article deals with the analysis of traffic accidents for a certain period in 2020 with a comparison with the year 2019. The basis is the evaluation for the specified period in 2020 for the whole of Slovakia and also for the Žilina region. It further analyzes the main causes of traffic accidents in the period under review. Subsequently, the article contains a time horizon of traffic accidents, analysis of traffic accidents with alcohol, traffic accidents involving pedestrians and non-motorized participants, traffic accidents in tunnels or at railway crossings. Finally, the analysis and the proposal of traffic-engineering measures to positively influence the safety and smoothness of road traffic for the near future is evaluated.

Keywords: traffic accident; crime; cooperation; security; analysis; state administration

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Protection of Transport Terminals through the Application of the CPTED Concept

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Abstract

The security, protection of lives and property of citizens depends on the proper functioning of many infrastructure systems. One of the essential elements of infrastructure needed to ensure living conditions is transport. It is necessary to deal with weaknesses in the sector such as railway, bus stations, which are referred to as soft targets. The CPTED concept (crime prevention through environmental design) is a new method through which we try to reduce crime with the right selected design and it is appropriate to apply it to transport terminals.

Keywords: soft target; transport terminals; CPTED concept

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Implementation of New Technologies to Improve Safety of Road Transport

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Abstract

The ongoing fourth industrial revolution will fundamentally change the way we live and work. In some areas, innovation are wide spread and visible. In others, more traditional ones like transport safety, the progress is much slower. In this paper, we review the impact of implementation of new technologies and automation on safety of road transport. Besides improving safety of transport, we can also use these technologies to improve efficiency and reduce environmental impact of transport. To emphasize the practical side of implementing new technologies, we did a research on past good practices and concrete examples of implementation of new technologies into transport. However, this paper focuses on the direct relationship between implementation of new technologies and automation on one side and increasing security, measured in saved human lives on the other.

Keywords: Road transport; Security; Safety measures; Transportation; New technologies

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Reduction of Pedestrian Accidents – Automated Road Vehicles

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Abstract

The number of traffic accidents is decreasing thanks to measures taken by the government and also by car manufacturers. However, despite the measures, thousands of people die on the roads every year. The most vulnerable group of road users are pedestrians. In this article we will deal with the measures and ways of reducing the occurrence of traffic accidents by pedestrian-vehicle, or at least reducing the consequences of a traffic accident. It is important to point out the development of traffic accidents not only in Slovakia but also in the EU and to point out the possibilities of elimination or improvement in this area. One of the innovative ways to reduce the number of accidents, in general, is automated road vehicles. Technologies and procedures used in automated road vehicles can significantly reduce accidents. For this reason, the basic technological systems are being developed, which contribute to the reduction of the accidents. The hardware and software equipment of automated road vehicles will be described in this article. It is also necessary to focus on the detection of pedestrians by an automated road vehicle, where machine learning and algorithms are used to calculate an estimate the direction of pedestrians and their movement in the traffic.

Keywords: Automated road vehicle; traffic accident; detection; pedestrian

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Specifics of RFID Based Access Control Systems Used in Logistics Centers

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Abstract

The development of access control systems has progressed rapidly in recent years and the market offers a wide range of different devices. The design of the access control systems is specific to each object. It depends mainly on the operational requirements and the value of the protected interest. Access control systems have their own specifics that must be used during the designing a security system. Logistics centers are an ideal object for the implementation of access control systems. Inconsistent selection of access devices can cause inefficient system functionality, leading to downtime and losses. Based on experimental testing and related works in the field of access control systems, the paper discusses the possibilities of using access control systems in logistics centers and points out the specifics of RFID based access control systems.

Keywords: security; logistics; warehouse; ACS; RFID

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Comparison of the difficulty overcoming of RFID electronic access control systems and overcoming of pin tumbler locks

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Abstract

At present, modern technologies are increasingly coming to the fore, including the area of entry security. Electronic access control systems that use RFID to identify people have become popular. However, as the name suggests, electricity is needed to operate them. There may be a power failure problem, causing the system to malfunction and entry is not allowed. Therefore, classic pin tumbler locks are used as a backup for electrical systems. Therefore, it is important to keep in mind the correct choice of pin tumbler locks, as these can be easily overcome, unlike the electronic access control system with RFID. The article deals with foreign research aimed at overcoming the electronic access control system with RFID and completed tests at the Faculty of Security Engineering aimed at overcoming pin tumbler locks.

Keywords: RFID, pin tumbler lock, breakthrough resistance

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Test Stand for Experimental Crash Tests at Low Speeds

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Abstract

The article presents a test stand with a control system and data acquisition for experimental crash tests at low speed. Crash tests are carried out at a low speed of the wheelchair and seat. Measurement and equipment allows to record and determine the displacements of individual parts of the body of the tested object. During the test, a constant speed of 20 km/h was kept. The paper presents test results of volunteers taking into account gender. The results of the conducted research showed that the trajectory of the head movement of female volunteers coincides with that of the male head. The result of these studies is an important argument for the construction of an anthropometric dummy intended for low speed crash tests, as the results can be averaged over the entire population without gender division.

Keywords: dummy, crash test, road accident

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Resilience of the Smart Transport System – Risks and Aims

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Abstract

In our previous research, me and my co-authors explained the Smart City and Safe City concepts and their common systems, with transport as one of them. As we continue with city systematization, our current focus is on defining resilience, its place in the systematization and deeper understanding of resilience within individual systems. In this article, I answered some of the questions with focus on the system of smart transport. What are the risks, threatening the resilience of transport system of the city? What are the aims when building resilient transport system? My answers to these questions, delivered for different levels of the system, are meant to set a base ground for further research of the topic, along with definitions of transport resilience, resilient city, and resilience as an ability itself. As an important part I consider differentiation between aims of resilience and of crisis management, as I encountered unclear, even replacing views on the topic.

Keywords: Resilience; Smart Transport; Safe City; Smart City;

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The Use of Simulation in Dealing with Crisis Events within Transport

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Abstract

Nowadays, modelling and simulation are used as tools to support decision-making processes in many areas. This article is focused on a description of possible usage of simulation within solving crisis phenomena in transport, where we focus on the education and training of professionals in different fields. The article consists of two main parts. The first part describes the theoretical approach towards simulation in the context of transport and crisis management. The second part presents possibilities of using simulation for solving crisis phenomena mainly in transport. This article provides concrete examples of the possible and practical uses of live simulation, virtual simulation, and constructive simulation in solving crisis events in transport with focus on a traffic accident.

Keywords: Simulation; Crisis Management; Transport

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Vulnerability Assessment and Risk Prioritization with HRVA Method for Railway Stations

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Abstract

We encounter the term of vulnerability in various spheres of life. Vulnerability is most often associated with security issues, but we can also encounter it in the economic, environmental or social spheres. In the security community, it is often associated with addressing natural and anthropogenic risks and analyzing indicators and properties of the environment that could cause undesirable consequences. In the economic sphere, vulnerability is associated mainly with risk management and solutions to those parts of the organization that may endanger her operation or economic tangible or intangible assets. We understand social vulnerability as a predisposition of a social actor to disrupt his existence, stability, development, integrity or damage to his interests or even the needs of life. The article contains a solution to the problem of identification and analysis of vulnerable physical locations of railway terminals with application to a specific object of a railway station.
The HRVA (Hazard, Risk and Vulnerability Analysis) method was chosen from several world-renowned concepts, methodologies and methods for vulnerability assessment. For the practical application of the method, software support was developed, which was applied in the article in the semi-quantitative assessment of the risk and vulnerability of the railway station. In addition to the HRVA method, the theoretical part clarifies the understanding of vulnerability as a determining parameter for risk management and detection of vulnerable places in the analyzed systems. The aim of the article is proposal and demonstrate a method of threat assessment with potential scenarios for the selected object - the railway station. The article also provides an overview of other, whether direct or indirect ways of assessing vulnerability and risks, in the form of theoretical or software solutions and tools.

Keywords: railway station; vulnerability; HRVA toolkit; risk prioritization

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Application of Close-Range Photogrammetry in Documenting the Location of an Accident

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Abstract

The article analyzes the possibilities of using photogrammetric methods in the inspection of the traffic accident scene by the Police. Experts in the field of road transport often carry out ex post inspections of the traffic accident scene using photogrammetric methods and only then use the results of an inspection carried out by the Police. They do this in order to have a more realistic view of the simulation of an accident during its reconstruction. A 3D model of a car accident site can be a rich source of information and a tool for better imagination what the car accident site looked like. The article presents the procedures of how a police officer should proceed when documenting a traffic accident, what tools for documentation they need in order to be able to create a 3D model of the place of a traffic accident from the prepared photo documentation. The article also presents the accuracy and reliability of this method in relation to additional measurements of dimensions and distances.

Keywords: documentation; accident site; photogrammetry; accuracy

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Effective Placement of Video Surveillance System Using 3D Scanning Technology for Traffic Safety

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Abstract

Video surveillance system is a system that has a very important place in the framework of ensuring the required level of safety on the road infrastructure and plays an important role in the management of road networks. At present, video surveillance systems cover relatively large parts of road infrastructure such as motorways, tunnels, bridges, trunk roads, city centers, car parks etc. The aim is to obtain a large amount of data, from which it is possible in case of need to extract specific information, e.g. video recording about traffic situations and traffic composition and useful information about vehicles. It is also possible to work out a very accurate reconstruction of the accidental events by using video recording and higher engineering tools. For this reason, it is important to pay attention to the application of innovative methods in the effective design and planning of location of the camera system and its individual elements. In this paper we focused on the presentation of a method based on the fusion of point clouds obtained by the technology of 3D laser scanning and PC-Crash software tool for the needs of security management. The main aim of this paper is to verify the usability of 3D scanning technology for security practice. Especially the advantages and benefits that this method brings are highlighted.

Keywords: VSS; 3D laser scanner; point cloud; design; security management

Risk Analysis of the Reference Object and the Range of the Integrated Rescue System

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Abstract

Safety needs are in the second place in Maslow's hierarchy of needs. This means that a sense of security is not only very important for us, but also necessary. The priority of feeling safe is reflected in everyday activities. From ordinary work to great life decisions. This is the reason why in today's modern world great emphasis is placed on various security measures. however, the modern world is based on freedom, and since it is impossible to create a completely safe world without restrictions on freedom, there are sometimes situations where it is necessary to intervene quickly with some units of the integrated rescue system.
This article focuses on the analyzes of the danger of the congress center, which serves as a cultural center in the city of Zlin where people meet for freedom and entertainment, which can be disrupted.
In the paper is used FMEA analysis (Failure Mode and Effects Analysis) and method of modeling for creation of map of city of Zlin and integrated rescue system.

Keywords: FMEA Analysis; Integrated Rescue System; Reference Object.

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Proposal AHP method for Increasing the Security Level in the Railway Station

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Abstract

Railway stations are objects that have a social significance because they provide services to customers and passengers of rail transport. There is a high frequency of movement of people in their premises and their near surroundings, but at the same time, it is true that these objects are characterized by a high level of vulnerability. In order to increase the level of vulnerability and safety, measures are usually taken in the form of regulations, rules on behavior in the building, movement in the building, prohibitions in the building, etc., but also the security elements that make up the protection system are used. How the security elements will be deployed and used must be thought and designed and only then decided on their application. It is the process of selection and application of security elements, which is the task of the subject decision-making that must be considered according to specific criteria, which will compare the individual possibilities or variants of using the elements. The decision-making process according to several criteria and variants is called multi-criteria decision-making. One of the methods used to calculate the optimal or most suitable variant for a railway station is the AHP method (analytical hierarchical process. In the article, the author describes the theoretical apparatus of multi-criteria decision making and the AHP method, which he applies in a case study to a specific object.

Keywords: AHP method, multi-criteria decision making, railway station

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Analysis of Traffic Crashes and Violations in a Developing Country

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Abstract

Traffic safety is a major public health concern in Qatar, a developing country in the Middle East. The purpose of this study was to investigate the characteristics of traffic violations and crashes in Qatar, identify their trends, and describe the patterns for different demographic groups during the period from 2005 to 2015. The analysis showed that the number of crashes and violations is increasing with the huge increase in population during the same period. On the other hand, the number of fatalities per 100,000 population is decreasing. The main cause of violations was exceeding the speed limit while the main contributing cause of crashes was careless driving. Male drivers, passengers, and pedestrians were more involved in severe crashes compared to other groups. Male drivers between the age of 20 and 29 years had the highest rate of fatalities among all groups. Although significant improvements in road safety were made during recent years and were reflected in the decrease of the number of fatalities per 100,000 population, more efforts are needed to decrease the number of violations and crashes. The data collection process was difficult since it involved multiple public agencies and ministries. This is a common challenge in developing countries. Therefore, it is recommended that public authorities establish a crash database system that includes detailed traffic safety data to fill the gap in the availability of traffic safety data and to provide enough information for the relevant entities to study traffic safety and develop countermeasures.

Keywords: traffic crashes; traffic violations; developing countries; traffic injuries; fatalities

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Analysis and Identification of Contributing Factors of Traffic Crashes in New York City

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Abstract

New York City is one of the most traffic-congested cities in the United States and the world. This study presents a comprehensive analysis of the total number of injured and killed people by road crashes in New York City in the period from 2013 to 2019. The purpose of the analysis was to examine the trend of crashes over time and identify the reasons for injuries and fatalities. The numbers of injured and killed road users were analyzed using yearly, seasonally, monthly, daily, and hourly time series. The hours of the day were compared based on four periods: morning peak, evening peak, off-peak, and night-time. The patterns on weekdays were compared to those on weekends. The types of injured and killed road users were analyzed based on different categories; pedestrians, cyclists, and persons (drivers and occupants). A total of 47 reasons for traffic-related crashes involving injuries and fatalities were analyzed comprehensively. A simple ranking method was developed. The top three reasons identified were driver distraction, failure to yield right-of-way, and exceeding the speed limit.

Keywords: car accidents; road safety; traffic injuries; fatalities; road crashes

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The Impact of Vehicle Fires on Road Safety

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Abstract

The article is focused on vehicle fires on highways and other roads. It is important to highlight the statistics of vehicle fires and the number of deaths and injuries that were caused by them on the roads of our country in the last ten years. This article also presents the statistics from The United States and the main causes of these vehicle fires and their reasons and compares the statistics of vehicle fires between the U.S. and the Slovak Republic.

Keywords: vehicle fire; investigation; mechanical failure; statistics

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Geometry Influence of Far-Side Wall of Tunnel Emergency Bay on the Traffic Safety

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Abstract

Goal of the road safety inspection in the Slovak Republic according to the Act 249/2011 Coll. is to assess the safety level of roads and motorways and to identify potential weak points from the road safety point of view. The results of road safety inspection can then serve as an objective data for traffic administrators and stakeholders for safety improvement as well as for legislators for changes in legislative that influence construction of road infrastructure. One of the potential road safety weak point is the far-side wall of tunnel emergency bay. In case of traffic accident its concrete wall acts as a rigid non-moveable obstacle with the geometry that will not allow practically any sliding of the vehicle (as a standard road safety guardrail would) and vehicle is stopped suddenly on very short distance and in very short time with severe consequences on the vehicle occupants. The focus of the presented article is to examine influence of simple changes to geometry of the far-side of tunnel emergency bay that could be implemented (after legislative changes) in the construction of tunnels. To analyze the problem, we used parametric simulations of vehicle impacts into far-side wall of emergency bay whereby far-side wall was sloped at various angles with respect to road axis. The simulations were performed in PC-Crash simulation software using finite element method module. Results indicate that simple changes to geometry of the far-side of emergency tunnel bay can provide significant reduction of impact severity, even if there are no deformable crash barriers used and impact is still into rigid concrete wall. The results of simulation calculations contribute to the conclusion that although the design and construction of the emergency bay is in accordance with the applicable legislation, it poses a serious safety risk for passengers.

Keywords: emergency bay; tunnel; safety; ASI; PC-Crash; finite element method

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The Influence of a Countdown Display On Pedestrian Behavior at a Signalized Pedestrian Crossing Equipped with a Pedestrian Refuge Island

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Abstract

The paper offers the analysis of pedestrian behavior at a signalized pedestrian crossing equipped with a pedestrian refuge island, depending on whether a pedestrian countdown display is installed or not. The cameras recorded pedestrians crossing the roadway with a refuge island, in a zone with two similar pedestrian crossings equipped with pedestrian refuge islands, in the area of the city of Belgrade (Serbia). A countdown signal for pedestrians installed at one of the pedestrian crossings showed the remaining time of the red light, while the second pedestrian crossing was not equipped with a countdown display. Video recordings, recorded time of the commencement of crossing the Stage 1 and 2 of the roadway (first and second roadway) were reviewed and analyzed in detail. The data on pedestrians, vehicles and times are entered into the tables specially prepared for this survey. The aim of the work was to observe and compare the models of behavior of a certain category of pedestrians at Stage 1 (to the refuge island) and Stage 2 (from the refuge island) of the pedestrian crossing, without and with a pedestrian countdown display.

Keywords: Pedestrian; pedestrian crossing; pedestrian refuge island; pedestrian countdown display; behavior.

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ŽRS Safety Management System of Freight Cars

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Abstract

The new concept of safety is reflected and developed in order to improve the safety of railway traffic in the newly created open market. In the new business conditions, subsystems related to freight cars must also meet a number of conditions in order to have a safe traffic, which are mainly related to technical specifications - TSIs. It is also very important to provide uniform procedures related to freight cars maintenance (ECM). The development of risk assessment and risk management methods has made it possible to replace reactive safety control methods with a modern proactive and systematic approach to safety management. In the new concept of safety and in accordance with the recommendations of the European Union and common methods for risk evaluation and assessment, it is necessary to perform risk assessment in railway transport, even in the subsystem of freight cars.

Keywords:safety; risk; freight cars; management

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Usage of Digital Evidence in the Technical Analysis of Traffic Collisions

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Abstract

The contribution deals with the basic principles of operation of EDR technology and the further process of obtaining and using data for the reconstruction of an accident. One of the many devices that leave a digital evidence is the EDR memory module, which is contained in the airbag control unit of a car and which can record and store data from the accident. The CDR system enables to download and decode the stored data from the airbag control module, that experts can use among others for the technical analysis of an accident and objectively reconstruct it. The future of the analysis of traffic accidents will lie in use of the CDR system and the correct evaluation of the technical data obtained from the memory of the airbag unit. Legislative and technical preparations, which are currently taking place in Europe, aim to establish clear rules and requirements for OEM companies to implement Event Data Recorder (EDR) all over. It shows what data should be stored in airbag unit, how long is the section and what frequency must be used for data acquisition. The aim of these preparations is to establish clear rules for passenger car manufacturers (category M1 and all vehicles complying with the requirements), which should enter into force in 2022.

Keywords: digital evidence, traffic accident, EDR, CDR system

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Assessment Framework of Performance Disruption of Critical Land Transport Elements Caused by Influent Subsystems

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Abstract

Land transport belongs among the most important critical infrastructure sectors of all European countries. Its importance is emphasized by a significant increase of the motorization rate or the ever-increasing density of the highway and railway networks during the last several years. The overall critical infrastructure system, including individual sectors, is mutually interconnected and various linkages develop among some of the sectors, subsectors, and elements (i.e., subsystems). When it comes to land transport, this especially applies to its dependency on the influent subsystems of the critical infrastructure. This dependency represents a problem, particularly when a subsystem that land transport relies on becomes disrupted. When this happens, a cascading transmission of the given impacts occurs, followed by disruptions of the performance of dependent elements of the land transport infrastructure. This study focuses on theses dependencies among individual subsystems. It forms a framework for assessing the performance disruptions of the land transport critical elements based on influent subsystems, thus enhancing the knowledge in the area of the protection of critical infrastructures.

Keywords: Land transport; critical infrastructure; critical element; influential subsystems; performance disruption

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Proposal of Risk Reduction Measures for the Construction of Smart Cities

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Abstract

The topic of ensuring the safe and efficient operation of smart cities is currently highly topical. In general, cities are required to effectively manage a wide range of incidents -from routine activities such as repairs and road accidents to life-threatening crises such as terrorist acts and natural disasters. If the city wants to effectively manage these incidents, it needs the ability to understand what is happening, to share information quickly, to direct responses based on standardized procedures, and then to constantly improve these procedures according to the best experience so far. The object of the research is the method, which is the introduction of a new information system in the field of building smart cities in practice. We solved the assignment through: Analysis of faults and their consequences (FMEA), using the process type of analysis.
When solving the security of the new information system in the area of smart city through the FMEA method was identified barriers / failures of individual steps that threaten the process. By designing and applying appropriate measures, we managed to reduce the residual risk of the information system so that all values were below the limit of risk acceptability.

Keywords: Risk; Security; Crisis phenomenon; Risk management; Smart city; FMEA method

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Sharing and Providing Information to Protect Soft Targets in the Railway Infrastructure

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Abstract

The use of rail transportation is still popular around the world. However, due to the high concentration of people, attackers do also target the railways. This concerns places which can be easily accessed by people, making it impossible to secure them completely. Railways constitute a so-called soft target, during the protection of which the key aspect is the safety of people, whereas in the case of key infrastructure elements, the aim is also to preserve their functioning. In the event of unexpected and disruption events, not only on the track or at a railway station, but also in their surrounding areas, it is important that not only the passengers learn of them, but also other carriers and other entities as quickly as possible. However, no uniform procedure for the sharing and providing information in rail transportation exists in the Czech Republic to date. This article presents the importance of procedure as regards various levels of interconnectedness of transport infrastructures.

Keywords: Sharing and providing information; Transport infrastructure; Railway station; Rail transportation; Soft targets; Security

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Indicator Approach to the Failure of Critical Road Transportation Infrastructure Elements

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Abstract

Security research is currently aimed at creating comprehensive solutions and measurable qualitative and quantitative parameters. One way is to create a system of indicators. Indicators can be understood to be data, information, knowledge, properties and many other variables. An indicator can be anything that has a certain telling value for evaluators or users, according to which it is possible to compare individual indicators with each other, to derive a validation result from them or to measure set goals according to them. Using indicators for expression is common in many areas. It is very rational, unambiguous, and therefore indicators are considered to be an informational tool that can be used to easily and clearly present changes in the monitored state. Based on this characterization, they allow the user to predict the future development or possible consequences of disruptive events to some extent. For this reason, they are also becoming an ideal tool for indicating the failure of critical elements of transport infrastructure. The paper presents the relational research of indicators, which provides a comprehensive framework of definitions and classification of indicators or an analysis of approaches and methods using indicators in the field of the protection of land transport infrastructure. The aim of this paper is to define the theoretical basis for the use of indicators in the process of indicating the failure of critical elements of land transport infrastructure, which will complement the existing possibilities of protection of these elements.

Keywords: Transport infrastructure; Structures; Element functions; Resilience; Indicators; Access

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Observation of Fire Characteristics of Selected Covering Materials Used in Upholstered Seats

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Abstract

The article deals with the evaluation of the initial ignition temperature and the temperature of surfaces of organic upholstery materials using selected initiation sources. The effect of the selected properties of the materials, the size of the contact surface between the initiating source and the combustible material, the layout during the initiation, and the duration of the exposure to the initiation source were monitored. The tests on upholstered furniture materials were carried out using three samples on a polyester base. The samples were chosen based on their prevalence and availability. We monitored their spontaneous flammability using various ignition sources and the size of the burnt-though area (cm). All tests were performed in accordance with applicable technical standards. The evaluation of the impact of the sample (weight) on smoldering time and degradation length was carried out using one-way ANOVA statistical analysis, which confirmed a significant difference between the samples.

Keywords: Upholstered Seats; Cigarette; Flame; Fire Characteristics

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Development and Preliminary Tests of a Low-Power Automatic Monitoring System for Flexible Debris Flow Barriers

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Abstract

Debris flows are a type of mass movement characterized by high velocities and rapid evolution over time. These features, together with their capability to transport huge amounts of material, make them one of the most hazardous natural processes for both human lives and man-made structures. Therefore, a timely and effective monitoring activity plays a major role in any mitigation and early warning action connected with debris flow, such as alert messages dissemination and road closures. This paper deals with the development of a new automatic system named Gflow Safety Network (GSN), designed to be installed on flexible debris flow barriers with the objective to monitor the structure behavior with a real time approach. The main component of the system (called Gflow module) integrates an accelerometer and an electronic board, and it is able to identify an impact that generates an acceleration value higher than a predefined threshold. In this scenario, the system activates the accelerometer sensor integrated in the module and triggers every other monitoring device installed on-site to acquire information on the ongoing phenomenon. A series of impact tests were performed on a prototype installed on a flexible structure, in order to verify the initialization time of the accelerometer sensor after the first threshold overcoming. The outcomes evidenced the good performances of the Gflow module, which was able to record the event following the first impact on the test structure.

Keywords: Debris flow; Monitoring; Early Warning; Accelerometer

TOPIC 7: Travel and Tourism Studies in Transport Development

Reviewers

Alena Novák Sedláčková

Marek Nowacki

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Ulrich Wollner

Authors are responsible for language and content of their abstracts.

The application of online marketing tools in marketing communication of the entities with the tourism offer in 2020 in Slovakia

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Abstract

This article discusses the situation on the online tourism market in Slovakia in 2020 and it focuses on the utilization of effective online marketing channels in the online environment during the year of pandemic. The utilization rate of selected online marketing channels has been identified and clearly described and compared according to the detailed content analysis and observation of the marketing approaches of analyzed entities with the tourism offer in Slovakia. The areas that the article focuses on the most are web pages, SEO, marketing on social media: Facebook and Instagram. As well as on the other factors influencing tourists' behavior directly or indirectly, where it is possible to include online WOM, blogging, vlogging, and mainly influencer marketing as well as online PR.

Keywords: online marketing, e-tourism, influencer marketing, online WOM

Does the state have a legitimate right to regulate the decisions of the population in the process of choosing of transport?

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Abstract

Current trends in the development of transport are moving towards to an increasing degree of environmental friendliness, autonomy and a reduction of the cost of production of means of transport. At present we can observe social as well as political efforts to apply these approaches in transport in practice. In the segment of reliability, safety and speed of transport, we are experiencing the most dynamic progress in history. In the context of these trends, the social sciences consider as very necessary to think about the possible risks of implementing technical advances in transport in practice. Although national governments as well as European Commission regulations aim to promote sustainable transport and at the same time gradually regulate energy-inefficient and non-ecological modes of transport, it is necessary to ask whether the nation state has a legitimate right to restrict or force individuals to a particular type of transport for the public good.

Keywords: liberalism; freedom; autonomy;

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