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NEW TECHNOLOGIES DEVELOPMENT AND APPLICATION
NOVE TEHNOLOGIJE RAZVOJ I PRIMJENA

BOOK OF ABSTRACTS
KNJIGA SAŽETAKA

Editors: Isak Karabegović, Ahmed Kovačević, Sead Pašić, Sadko Mandžuka



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NOVE TEHNOLOGIJE - RAZVOJ I PRIMJENA

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NEW TECHNOLOGIES - DEVELOPMENT AND APPLICATION „NT-2020“

Word of the organizers

We are aware of a different problems that the contamporary economy suffer. Research capacities are limited and infrastructure is poorly developed. Companies fall in using the contemporary knowledge and specialization, rarely promote innovation and commercialization, poorly manage research facilities and technology transfer. All this ultimately leads to their inadequate capacities to meet market demands, as well as lagging in a regional development and a low competitiveness. The organizers are going to prepare the series of free seminars, conferences and round tables for the economy, small and medium enterprises, with the goal to introduce new capacities and the possibilities of the technology development. Thus the organizers want to encourage technology transfer, development projects and innovative work, as well as develop awareness of the importance of intellectual property protection. In a product development, from concept to its production, a key element in achieving market success, is time. With ever stringent market requirements, the trends in increasing product individualization (personalization) become more obvious, and there are fewer products of mass consumption. Alternative solutions in production are increasingly being used to meet such conditions in the development and production. The organizers' intention is to introduce new methods and technologies to our market, as well as to inform the engineers, designers, contractors and investors about the possibilities and advantages of new methods and technologies, as well as products in their technical and financial form. The aim is to bring closer new 21st century technologies, that are in use in developed countries, to professional public in above mentioned conferences, seminars and round tables. With their development trends and achievements, new technologies can contribute to the development of both small and medium-sized enterprises and large companies, and thus to develop the local community in which they operate. The goals of conferences, seminars and round tables is that manufacturing companies as well as research and development institutions become more familiar with the latest technical and technological achievements in the field of new technologies used in the 21st century.

Sarajevo, 24th May 2020 *THE ORGANIZERS*

NOVE TEHNOLOGIJE - RAZVOJ I PRIMJENA „NT-2020“

Uvodna riječ organizatora

Uočili smo veliki problem današnjeg gospodarstva. Istraživački su kapaciteti ograničeni, infrastruktura slabo razvijena, kompanije zaostaju za suvremenim znanjem i specijalizacijama, rijetko promoviraju inovacije i komercijalizacije, slabo se upravlja istraživačkim kapacitetima i transferom tehnologija, što u konačnici dovodi do neadekvatnih kapaciteta kompanija za odgovor na zahtjeve tržišta, zaostajanja u regionalnom razvoju i niskoj konkurentnosti. Organizatori pripremaju seriju besplatnih seminara, konferencija i okruglih stolova za privredu, mala i srednja poduzeća, na kojima ih žele upoznati s novim kapacitetima i mogućnostima koje nude. Time također žele potaknuti transfer tehnologije, razvojne projekte, inovativni rad i razviti svijest o važnosti zaštite intelektualnog vlasništva. Pri razvoju proizvoda, od ideje do njegove proizvodnje, ključni element u postizanju uspjeha na tržištu je vrijeme. Uz sve oštrije zahtjeve tržišta, očitiji su i trendovi u porastu individualizacije (personalizacije) proizvoda, a sve je manje proizvoda masovne potrošnje. Kako bi se udovoljilo takvim uvjetima pri razvoju i proizvodnji, sve se više primjenjuju alternativna rješenja u proizvodnji. Namjera je organizatora približiti nove metode i tehnologije našem tržištu i upoznati inženjere, projektante, izvođače, te investitore o mogućnostima i prednostima novih metoda i tehnologija, kao i proizvoda u njihovom tehničkom i financijskom obliku. Stručnoj javnosti ovakvim konferencijama, seminarima i okruglim stolovima želimo približiti nove tehnologije 21. stoljeća koje su u upotrebi u razvijenim zemljama u svijetu. Nove tehnologije svojim trendovima razvoja i dostignućima mogu doprinijeti razvoju kako malih i srednjih poduzeća, tako i velikih kompanija, te na taj način razviti lokalnu zajednicu u kojoj djeluju. Ciljevi konferencija, seminara i okruglih stolova će biti takvi da proizvodnim tvrtkama i razvojno-istraživačkim institucijama približe najnovija tehničko-tehnološka dostignuća na području novih tehnologija koje se koriste u 21. stoljeću.

Sarajevo, 24. maj, 2020.god. *ORGANIZATORI*

PREFACE

Modern industrial production is exposed to many influences and problems that prevent the strengthening of market competitiveness. Let us mention a few of them: materials and raw materials are constantly becoming more expensive, and some even disappear, so a suitable replacement should be found; mass production disappears, and large series manufacturing decreases, while small-scale and medium serial production increases to some extent; new production philosophy demands and prefers highly educated personnel able to successfully implement new technologies; technologies, as well as knowledge, quickly become obsolete, which requires lifelong learning, i. e. constant update of already acquired knowledge; environmental requirements are stronger and higher, which increases companies' costs and funds to invest in equipment (there is a demand for pollution and waste materials reduction, greater work safety, recycling, etc.); market is full of various goods and products of questionable quality from medium developed countries and often with dumping prices; there are ever increasing demands for wage increases, which forces the owners to dislocate their production facilities or move to countries with cheaper labor force; increased education of personnel affects their mobility and increase of fluctuation, as well as greater opportunities in the choice of better jobs, so that they make more use of their intellectual and emotional capabilities, thereby changing the mental structure of employees; customers are increasingly looking for a good design, durability and good price, with a wide range of support and service, not just a product; customers' knowledge is increasing, thus causing the increase in requirements that a product must be flawless in every respect, rather «ideal» (well designed, reliable, stylish, economical, etc.). To successfully solve the abovementioned requirements, there are new technological, production, organizational and other methods and models that ensure the improvement and modernization of production in the preparation phase (modern methods of product design, methods for modeling, simulation and optimization of products and production program, evolutionary methods – methods of artificial intelligence, software and computer hardware), as well as in the realization phase of production (flexibility, innovation, productivity, automation, product quality) we can name it all with a single word "Industry 4.0", which is already present around us, but its concept is not widespread.

The main objectives of the conference are:

- *Transfer of new and high technologies towards the development of scientific research work and implementation in production, in order to achieve technological and economic growth production in companies*
- *Transfer of innovations and practical knowledge and results of our own research, with the aim of strengthening competitiveness of companies.*
- *Promotion of technological and economic feasibility of applying new technologies in companies' industrial production, as well as "Industry 4.0".*
- *Organizing and conducting education to prepare young people for jobs will be in the future, to use technologies that will be, discovered, for competitiveness that will be global.*
- *Performing training courses in new technologies, production and business systems, integrated product development, implementation and maintenance of quality systems, production logistics, acquisition of competitive ability in the market, the application of modern methods in production management, the development of modern and successful production, etc.*
- *Education of the implementation of "Industry 4.0" with the aim of improving many aspects of human life.*

Sarajevo, 24th May 2020 *THE ORGANIZERS*

PREDGOVOR

Suvremena industrijska proizvodnja je izložena mnogim utjecajima i problemima koji ometaju jačanje konkurentnosti na tržištu. Evo samo nekih od njih: materijali i sirovine neprestano poskupljuju, a neki i nestaju, pa im valja naći odgovarajuću zamjenu; masovna proizvodnja nestaje, a velikoserijska se smanjuje, dok raste maloserijska i donekle srednjeserijska proizvodnja; nova proizvodna filozofija uvjetuje, preferira visoko educirane kadrove sposobne da uspješno implementiraju nove tehnologije; tehnologije kao i znanja brzo zastarijevaju, što zahtijeva cjeloživotno učenje, odnosno stalno osvježavanje već stečenih znanja; sve su oštriji i veći ekološki zahtjevi, što poduzećima povećava troškove i sredstva za investiranje u opremu (traži se smanjenje zagađivanja i otpadnih materijala, veća sigurnost u procesu rada, reciklaža otpada i sl.); tržište je sve punije raznovrsnim proizvodima ali i proizvodima upitne kvalitete iz srednje razvijenih zemalja i često s damping cijenama; sve su veći zahtjevi za porastom plaća, što vlasnike prisiljava da svoje proizvodne pogone dislociraju, odnosno presele u zemlje sa jeftinijom radnom snagom; porast obrazovanosti kadrova sve više utječe na njihovu mobilnost i porast fluktuacije, te veće mogućnosti u izboru boljih radnih mjesta, kako bi više koristili svoje intelektualne i emocionalne mogućnosti, čime se mijenja mentalna struktura zaposlenih; kupci sve više traže dobar dizajn, trajnost i povoljnu cijenu proizvoda, uz široki asortiman i servisne usluge, a ne samo proizvod; znanje kupaca sve je veće, zbog čega nastaju i sve veći zahtjevi da proizvod mora biti bez greške u svakom pogledu, bolje rečeno «idealan» (dobro dizajniran, pouzdan, moderan, ekonomičan itd.). Za uspješno rješavanje navedenih zahtjeva postoje nove tehnološke, proizvodne, organizacijske i druge metode i modeli koji osiguravaju unapređenje i modernizaciju proizvodnje u fazi pripreme (moderne metode oblikovanja proizvoda, metode modeliranja, simulacije i optimizacije proizvoda i programa proizvodnje, evolucijske metode-metode umjetne inteligencije, softverske i računalne tehnike), kao i u fazi realizacije proizvodnje (fleksibilnost, inovativnost, proizvodnost, automatizacija, kvaliteta proizvoda),sve to možemo nazvati jednom riječi „Industrija 4.0“, koja je već prisutna oko nas ali njen koncept nije dovoljno rasprostranjen.

***Osnovni ciljevi održavanja konferencije su slijedeći**:*

- *Transfer novih i visokih tehnologija u pravcu razvoja naučnoistraživačkog rada i implementacije u proizvodnji, s ciljem ostvarenja tehnološkog i ekonomskog rasta proizvodnje u kompanijama.*
- *Transfer inovacija i praktičnih znanja i rezultata vlastitih istraživanja, s ciljem jačanja konkurentske sposobnosti kompanija.*
- *Promocija tehnološke i ekonomske opravdanosti primjene novih tehnologija u industrijskoj proizvodnji u kompanijama, kao i“Industrije 4.0“.*
- *Organiziranje i izvođenje edukacija da pripreme mlade ljude za poslove koji ce biti u budućnosti, kako bi koristili tehnologije kojeće biti u budučnosti, za konkurentnost koja će biti globalna..*
- *Izvođenje edukacijskih predavanja iz novih tehnologija, proizvodnih i poslovnih sistema, integriranog razvoja proizvoda, uvođenja i održanja sistema kvalitete, logistike proizvodnje, stjecanja konkurentske sposobnosti na tržištu, primjene modernih metoda u upravljanju proizvodnjom, razvoju moderne i uspješne proizvodnje, itd.*
- *Edukacija o opravdanosti implementaciji „Industrije 4.0“ sa ciljem poboljšanja mnogih aspekata ljudskog života.*

Sarajevo, 24. maj, 2020.god. *ORGANIZATORI*

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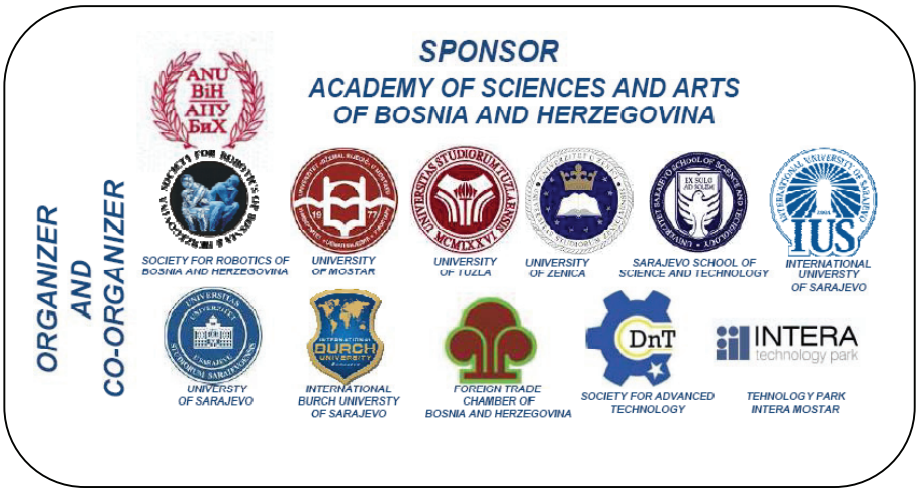

PLENARY SESSION

6th International Conference

"New Technologies, Development and Application“ NT-2020

Sarajevo, 25th-27th June 2020

ACADEMY OF SCIENCES AND ARTS OF BOSNIA AND HERZEGOVINA

Rajkumar Roy
City, University of London, School of Mathematics, Computer Science and Engineering, Northampton Square, London,
United Kingdom

Topic: “SELF-ENGINEERING – TECHNOLOGICAL CHALLENGES”

Biography:

Professor Rajkumar Roy joined City from Cranfield University, where he was Director of Manufacturing. Professor Roy holds a PhD in Computing from the University of Plymouth (UK) and BEng and MEng degrees in Production Engineering from Jadavpur University in India.
He started his career as an engineer at Tata Motors; pioneered research in Through-life Engineering Services (TES) with Rolls-Royce, BAE Systems, Bombardier Transportation, the Ministry of Defence and Babcock International; and established an internationally known TES Centre. Professor Roy's cost engineering and obsolescence research has transformed contemporary understanding of the engineering effort required to design, make and support high-value products, resulting in tools used by BAE Systems, Airbus, the Ministry of Defence, Rolls-Royce, and Ford Motor Company.
He is a Founding Editor-in-Chief of the Elsevier Applied Soft Computing journal and a Fellow of the CIRP (International Academy for Production Engineers), the Institute of Engineering Designers (IED), and the Higher Education Academy (HEA).
Professor Roy has advocated creative thinking in higher education and has started several new initiatives over the last twenty years. An initiative was to set up a new Centre for Competitive Creative Design (C4D), this is around £5.5m investment from HEFCE, Cranfield University, UAL and EEDA. The Centre aims to embed design thinking across enterprises to improve their creativity and make them more competitive. This is an initiative to link design with science, technology and management.

Tomislav Josip Mlinarić
University of Zagreb,
Faculty of Transport and Traffic Sciences,
Zagreb,
Croatia

Topic: “MODERNIZATION OF RAILWAY INFRASTRUCTURE- A NEW PARADIGM”

Biography:

Tomislav Josip Mlinarić graduated at the Faculty of Transport and Traffic Sciences at the University of Zagreb in 1994. On November 15, 2002, he finished his doctoral dissertation entitled Long-Term Quality Assessment of Track Geometry in order to identify maintenance requirements. In 2004 he was elected Assistant Professor in the field of Technical Sciences. From April 22, 2004 to September 29, 2005, he acted as President of the Management Board and General Director of Croatian Railways. He is the founder of the Intermodal Promotional Center IPC Danube - Adriatic (2004) and its first president. He is currently a board member of IPC. Since 2007 he has been a member of the Editorial Board of the journal Traffic - Traffic and Transportation. He acted as a Vice-Dean for Science and External Cooperation for two terms since 2013/14. to 2018./19. During this period he was also chairman of the Scientific Committee of the International Scientific Conference “Science and Development of Transport” (ZIRP).In October 2015 he was elected to the scientific-teaching title of full professor (first choice) in the field of technical sciences, field of transport technologies and transport. As of October 1, 2018, he is the Dean of the Faculty of Transport and Traffic Sciences, University of Zagreb. At the same time, he is a permanent member of the Technical Council and the Senate of the University of Zagreb. By decision of the Rector of the University of Zagreb in February 2019, he was appointed to the Committee on Science and International Cooperation of the University of Zagreb. Since February 2019 he has been the Head of the Land Transport Section of the Scientific Council for Transport at the Croatian Academy of Sciences and Arts. In May 2019 he was elected to the scientific title of scientific advisor in the permanent profession in the scientific field of technical sciences - the field of traffic technologies and transport. He has published twenty papers in scientific journals and 45 papers in proceedings of international conferences. He speaks fluent English, German and Slovenian.

Domenico Guida
Department of Industrial Engineering –
University of Salerno
Italy

Topic: “OPUS 4.0 – A ROBOTIC ARM FOR SATELLITE”

Biography:

Domenico Guida is a Full Professor at the Department of Industrial Engineering of the University of Salerno, and the Director of the International Master in Engineering and Innovation Management (operational headquarters in Bogota (CO)). He is the coordinator of joint academic projects between European and Latin American universities and since 2019 he is the Director of ITACOL, an International University Center composed of European and Latino American universities. He has been the principal investigator of national research projects (PRIN) and tutor of dozens of Ph.D. students. He has been a member of AIMETA, ASME, SEM, and he is author of more than one hundred scientific papers (h-index 22), in Applied Mechanics, Rotordynamics, Tribology, Mechatronics, and Control Systems. He has been an expert evaluator of R&D projects co-funded by EU and Italian Government, and since 2017 he is the CEO of MEID4 Ltd., an Academic Spin-Off of the University of Salerno, whose mission is to cooperate with European SMEs for developing of joint R&D projects in manufacturing, transport, and agro-industrial sectors.

Since 2010 he is leader projects of industrial research programs co-funded by EU and National institutions for the development of: Unmanned Ground Vehicles, Operating Machines, Aircraft for Special Missions: MILVUS (RPAS - Remotely Piloted Aircraft Systems), DOOR 4.0 (Optimization of Aircraft Cargo Doors), OPUS 4.0 (Aerospace Robots), MCR - (Robots for Building Maintenance), HAPS_2020 (A new High Altitude Platform Station), GRINTA (Green Intelligence on TomAto Industry) (only those with a budget of more a million euros).

CONTENTS – SADRŽAJ

SELF-ENGINEERING – TECHNOLOGICAL CHALLENGES

Rajkumar Roy[1], Sam Brooks[1]
[1]City, University of London, School of Mathematics, Computer Science and Engineering, Northampton Square, London, EC1V 0HB, UK


Rajkumar Roy


Sam Brooks

ABSTRACT:
Engineered products are becoming more complex and need longer lifetime availability;there is a need for new approaches is maintaining, repairing and overhaul (MRO). This paper presentsthe concept of self-engineering; the aim is to preserve the functions of a product or system and extend its lifetime and automate MRO processes. New developments in self-healing materials, self-reconfiguring electronics and robotics, which are already or could be self-engineering systems, are reviewed. Biological healing and repair mechanismsare discussed as a potential source of inspiration for new self-engineering systems. Examples of biological self-engineering are presented.Key technological challenges and research questions which need to be addressed in future self-engineering research are discussed throughout.

Keywords: *Self-engineering, through-life engineering services, repair, maintenance, self-healing*

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1. INTRODUCTION

Everything engineered will eventually break.Maintenance Repair and Overhaul (MRO) services can delayand extend product life and fix problems when they occur.However, in some systems, MRO is difficult to implement because it is too costly, or systems are inaccessible. This paper presents the concept of a self-engineering (SE) system that aims to deliver zero-maintenance products. This approach is ambitious but can draw on inspiration from existing man-made and biological mechanisms, such as self-healing, self-reconfiguration, self-adaptation and self-repair. SE can be implemented at a system, sub-system or component level, solutions from different levels have been discussed in this paper. However, the authors current work focuses mainly of a system level SE solution.

The objective of this paper is to present an overview of current SE methods and technologies relating to MRO. Research questions which need to be addressed in future work are presented throughout the paper and offer many potential areas of research.

MODERNIZATION OF RAILWAY INFRASTRUCTURE- A NEW PARADIGM

MODERNIZACIJA ŽELJEZNIČKE INFRASTRUKTURE– NOVA PARADIGMA

Tomislav Josip Mlinarić
Faculty of Transport and Traffic Sciences, Vukelićeva 4, HR-10000 Zagreb

Tomislav Josip Mlinarić

ABSTRACT:
The methodological shift of the paradigm in the field of railway infrastructure modernization is conditioned, above all, by a misunderstanding of the concept of "strategy", which results in the failure to achieve the set goals and in the inappropriate material expenditures. The use of the term in our reality is superficial and therefore misleading, because the content of the term "strategy" is not understood. The drafting of various state, political, economic, legal, social, and even military documents, as guiding instruments of state, economic and other activities, confirms this. A key factor in solving this problem in the area ofthe railway transport system is the consistent establishment of criteria for the original methodological approach. It primarily refers to determining the target capacity of the railway infrastructure network ascontributors to transport demand; implementation of the relevant concept of interval timetable in the segment of passenger rail transport; the development of transport (railway) infrastructure as a logistics platform in the rail freight transport segment; and the implementation of the concept of high efficiency rail network (as a target network)in the railway infrastructure segment.
Keywords: *paradigm shift, target capacity, interval timetable, logistics platform, target network*

SAŽETAK:
Metodološki pomak paradigme u području modernizacije željezničke infrastrukture uvjetovan je prije svega pogrešnim razumijevanjem pojma „strategija“ što ima za posljedicu neostvarivanje zadanih ciljeva te neprimjerene materijalne izdatke. Uporaba pojma u našoj stvarnosti površna je, a time i pogrešna, jer nije pojmljen sadržaj pojma „strategija“. Izrada raznih državnih, političkih, ekonomskih, pravnih, socijalnih, pa i vojnih dokumenata, kao usmjeravajućih instrumenata državnih, gospodarskih i drugih djelatnosti to potvrđuje. Ključan čimbenik u razrješenju ovog problema u području željezničkog prometnog sustava konzistentno je utvrđivanje kriterija originalnog metodološkog pristupa. On se u prvom redu odnosi na: utvrđivanje ciljnog kapaciteta željezničke infrastrukturne mreže u funkciji prometne potražnje; u segmentu željezničkog putničkog prijevoza implementacija odgovarajućeg koncepta taktnog voznog reda; u segmentu željezničkog teretnog prijevoza razvoj prometne (željezničke) infrastrukture kao logističke platforme i u segmentu željezničke infrastrukture implementacija koncepcije željezničke mreže visoke učinkovitosti (kao ciljne mreže).
Ključne riječi:*pomak paradigme, ciljni kapacitet, taktni vozni red, logistička platforma, ciljna mreža*

OPUS 4.0 – A ROBOTIC ARM FOR SATELLITE

Domenico Guida
Department of Industrial Engineering, University of Salerno

Domenico Guida

ABSTRACT:
OPUS 4.0 is the title of a joint project between the University of Salerno and an Aerospace Italian Company (http://www.aeronet.it/en/). The goal is the development of a Robotic Arm for the Orientation of Satellite Trusters.
The project has been co-funded in the framework of structural funds of the European Commission.
The speaker will give you an overview of the most critical and challenging tasks that the partnership is facing for the development of the robot:

1- Synchronize the movement of the arms so as not to disturb the attitude of the Satellite during their deployment;
3-Piloting the motors to keep the thrust line passing through the center of mass;
4- Power the Thrusters electrically;
5- Transport fuel from the tanks to the thrusters;
6- Ensure the protection and disposal of heat due to solar radiation;
7-Being "damage tolerant" about impacts with space fragments, or micrometeorites;
8- Manage and minimize the consequences of possible failures;
4- Power the Thrusters electrically;
5- Transport fuel from the tanks to the thrusters;
6- Ensure the protection and disposal of heat due to solar radiation;
7-Being «damage tolerant» about impacts with space fragments, or micrometeorites;
8- Manage and minimize the consequences of possible failures.

A REINFORCEMENT LEARNING CONTROLLER FOR THE SWING-UP OF THE FURUTA PENDULUM

Domenico Guida[1], Camilo Andrés Manrique Escobar [2], Carmine Maria Pappalardo[3]
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[2]MEID4 Academic Spin-Off of the University of Salerno,Fisciano, Italy



D. Guida *C. A. M. Escobar* *C. M. Pappalardo*

ABSTRACT: *In this paper, a nonlinear control strategy is developed by applying the Reinforcement Learning (RL) approach to control engineering tasks. To this end, the swing-up problem of the Furuta pendulum is solved as a benchmark example considering the presence of dry friction as a function of the instantaneous reaction forces. In the paper, a detailed description of the mechanical system is provided, including the equations of motion and the reward function used in the control algorithm based on continuous and sparse signals. The performance of the deep deterministic policy gradient algorithm in the proposed environment is also evaluated by means of numerical experiments.*

Keywords: *Reinforcement learning, Furuta pendulum, dry friction, multibody dynamics.*

---

1. INTRODUCTION

Reinforcement Learning (RL) is a type of machine learning technique dealing with the search of the optimal sequential decision-making. This computational approach is aimed at learning from interaction and is inspired by human and animal learning psychology, which has been an attractive research field since its inception. In the workflow of RL, the agent learning takes place through a tentative evaluation process guided by the reward feedback. Deep RL is the combination of RL and deep learning, with application in diverse areas such as portfolio management, self-driving cars, where it has become a turning point with respect to classic approaches [1, 2], control engineering, and robotics. In industrial applications of mechanical engineering[3-5], the investigation of the nonlinear dynamical response of mechanical systems due to external forces is of great interest [6-9], in particular for the control of dynamical systems[10-12], one of the main applications of RL, which provides an optimal control strategy that is learned rather than programmed by a human designer.

INTEGRATION OF CAD, MBD, AND FEA PROGRAMS FOR THE TOPOLOGY OPTIMIZATION OF AIRCRAFT COMPONENTS

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[2] Department of Industrial Engineering, University of Salerno, Fisciano, Salerno, Italy


A. G. Manca C. M. Pappalardo

ABSTRACT:
This research paper proposes a general integration approach between a CAD (Computer-Aided Design) software, an MBD (Multi-Body Dynamics) software, and an FEA (Finite Element Analysis) software. The proposed method is used in the design of a cargo hatch. For this purpose, the programs used are SOLIDWORKS, MSC ADAMS, and ANSYS. To achieve the topological optimization, the proposed integration technique is applied to a flexible component of a cargo hatch opening system. To find the loading conditions, the mechanical parts of the opening mechanism are considered as rigid bodies, while the support element of the opening system is assumed to be deformable. Finally, the topological optimization of the component under study is carried out obtaining a reduction of its mass with a change in its structural strength, but under a certain limit. The results found in this study are considered significant because applying the proposed method to various parts of the aircraft can lead to a redesigned opening system with a reduction in the total weight of the aircraft.

Keywords: *Topology optimization, CAD, Multibody, FEA, Aircraft components.*

---

1. INTRODUCTION

In the world of modern engineering, the number of programs for the computer aided design and analysis is enormous. These are used as decision support systems in several workplace environments. Mechanical engineering is also pervaded by simulation software and the lack of communication existing between the different programs is a subject that is the object of current research since it is proved that this issue leads to a substantial waste of money and time. In particular,the reference research framework of this paper is multibody dynamics [1-10] and nonlinear control [11-13]. An important problem that is studied by some branches of engineeringis the dynamic response of mechanical systems described by nonlinear equations [14]. For example, in the design of a new structure, the support of 3D design software helps to study the behavior of mechanical systems [15].

TECHNOLOGICAL FEATURES OF LOCATING CHARTS IN FIXTURE DESIGN

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Oleksandr Liaposhchenko


Dmytro Pirogov

ABSTRACT:
According to modern technological requirements, the problem of increasing the efficiency of drilling-milling-boring machine tools is the first priority in multiproduct manufacturing. In this regard, the use of fixtures is an obvious stage in ensuring the quality and accuracy of engineering products. In this paper, the main objectives are related to the choice of locating charts in fixture design. Based on the developed algorithm, a reasonable choice of locating elements for parts is implemented using the 3-2-1 locating chart. Additionally, the decision-making sequence is given in the process of choosing the functional elements of the fixture using the database. The related algorithm considers the design and technological features of the workpiece. The practical significance of the research is in the application of CAFD for the proper choice of fixture locating elements. As a result, the proposed approach allows increasing the efficiency of designing technological equipment and reducing the complexity of technological preparation of the manufacturing process.

Keywords: *CAFD, flexibility, automation, algorithm, accuracy*

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1. INTRODUCTION

Modern machine-building production is characterized by multifaceted products and instability of production volumes. The wide variety of parts requires machining to achieve the accuracy of size, shape and relative positioning, as well as the quality of the surfaces according to the technological requirements. All types of parts require accurate locating and reliable clamping during machining to provide the designer-specified parameters, which will ensure the efficiency and reliability of the final product. In this regard, considerable attention is paid to fixtures [1]. Given the advanced technological capabilities of modern machine tools, their high cost and the need for a large number of adjustments for machining parts of another size, rapid development is the intensification of production [2].

ANALYSIS OF ACCURACY AND ADEQUACY OF DYNAMIC MODELS OF OBJECTS

ANALIZA TOČNOSTI I ADEKVATNOSTI DINAMIČKIH MODELA OBJEKATA

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[1]Donbass State Engineering Academy (DSEA), Kramatorsk, Ukraine,
[2]High Technical Mechanical School of Professional Studies, Trstenik, Serbia,




S. Kovalevskyy *O. Kovalevsk* *A.Koshev* *V. Jevremović*

ABSTRACT:
The article formulates the main problems of ensuring the accuracy and adequacy of dynamic models of objects. It is shown that such problems are characteristic of conditions that are distinguished by the need to maintain the current state of control systems. A technique for assessing dynamic models of objects based on the parametrization of general laws to achieve accuracy and adequacy of mathematical models is presented. Recommendations on the formation of training and test sets formed from constantly renewed sets of precedents for dynamic modeling are given.

Keywords: *identification, modeling, modeling accuracy, adequacy of mathematical models, neural networks (NN).*

SAŽETAK:
U članku su formulisani glavni problemi obezbeđivanja tačnosti i adekvatnosti dinamičkih modela objekata. Pokazano je da su takvi problemi karakteristični za uslove koji se odlikuju potrebom da se održi trenutno stanje kontrolnih sistema. Predstavljena je tehnika za procenu dinamičkih modela objekata zasnovanih na parametrizaciji opštih zakona kako bi se postigla tačnost i adekvatnost matematičkih modela. Date su preporuke za formiranje skupova za obuku i testove koji se formiraju iz stalno obnavljanih skupova presedana za dinamičko modeliranje.

Ključne riječi: *identifikacija, modeliranje, tačnost modeliranja, adekvatnost matematičkih modela, neuronske mreže (NN).*

ACHIEVING CROWNING CONTACT OF SPUR BEVEL GEARS THROUGH DELIBERATELY INTRODUCED MOUNTING ERRORS

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[1]Odessa National Polytechnic University, Odesa, Ukraine
(South Ukrainian National Pedagogical University named after K. D. Ushynsky, Odesa, Ukraine



Ivanov Viktor *Urum Galyna* *Ivanova Svitlana*

ABSTRACT:
Spur bevel gears are characterized by a load concentration at the ends of the teeth, where gear teeth are at their weakest. To reduce load concentration at the ends of the teeth, the modification is used by longitudinal crowning of a flank profile. The crowning contact in a spur bevel gear can be achieved through deliberately introduced mounting errors. With a deviation of the shaft angle along with the deviation mounting distance, it is possible to achieve initial contact in the middle of gear tooth surfaces. The problem of the theory of gearing is solved - dependencies are obtained to determine the initial contactpoint of the teeth. For this, the intersection line of an octoid surface of the tooth and a plane of gearing was found, in the presence of mounting errors. The trajectory of the contact point on the surface of the teeth during mating was determined. The maximum achievable contact crowning values are given depending on the degree of transmission accuracy and the total number of teeth. Crowning is calculated for the range of modules 6.3 ... 10. A fixture design forcontrolling axial displacement during gear assembly has been developed.

Keywords: *crowning profile, spur bevel gears, deliberately mounting deviation*

---

1. INTRODUCTION

Bevel gears, compared with cylindrical ones, have a more complex design, manufacturing and mounting technology. Because of this, it is difficult to achieve the theoretically correct contact of the teeth. This is especially true for spur bevel gears. In this train, any manufacturing and mounting errors lead to the edge contact of the teeth. In spur gears, a crowning contact is used to avoid edge contact. Crowning contact creates certain technological problems. There are a number of manufacturing methods for crowning contact in spur gears. In spur bevel gears, the manufacture of a crowning contact is more expensive and it has not been widely used. Advances in the gear manufacturing technology have led to decrease in the amount of gears, manufactured through cutting [1].

THE STUDY OF THE ELASTIC CHARACTERISTICS OF THE COUPLING WITH NONLINEAR FEEDBACK WHEN STARTING THE MOTOR

ISTRAŽIVANJE ELASTIČNIH KARAKTERISTIKA KVAČILA SA NELINEARNIM NADZOROM PRILIKOM POKRETANJA MOTORA

Victor Kurgan, Igor Sydorenko, Ihor Prokopovich,
Liubov Bovnegra, Tetiana Lysenko
Odessa National Polytechnic University (ONPU), Odessa, Ukraine





Victor Kurgan *Igor Sydorenko* *Ihor Prokopovich* *Liubov Bovnegra* *Tetiana Lysenko*

ABSTRACT:
The most difficult moment in the work with an asynchronous motor is the launch. And the more powerful drive is the more difficult launch. This is due to certain features of the asynchronous motors: a limited starting torque and starting throws of the current of the stator motor chain. The mathematical modeling of oscillating process of actuation of the actuator with an asynchronous motor, which includes an elastic coupling with nonlinear mechanical feedback, is carried out. The influence of the type of elastic characteristics of the coupling on the magnitude of the amplitude and frequency of the oscillation process and its time was studied. A single-mass rotational system model was used for the studies. According to the Runge-Kutta method, the oscillation processes of starting the transmission of a machine unit with an induction motor were investigated. To determine the coefficient of vibration isolation, a system with an elastic coupling having a linear elastic characteristic was calculated….
Keywords: *elastic coupling, mechanical feedback, oscillation process, rotational mass, starting torque.*

SAŽETAK:
Najteži trenutak u radu sa asinhronim motorom je pokretanje. A što je snažniji pogon, to je teže lansiranje. To je zbog određenih karakteristika asinhronih motora: ograničenog početnog momenta i početnih bacanja struje lanca statora motora. Izvršeno je matematičko modeliranje oscilatornog procesa aktiviranja aktuatora asinhronim motorom, koji uključuje elastično kvačilo sa nelinearnom mehaničkom povratnom informacijom. Ispitan je uticaj tipa elastičnih karakteristika kvačila na veličinu amplitude i učestalosti oscilacionog procesa i njegovo vreme. Za studije je korišćen model jedno-masenog rotacionog sistema. Prema metodi Runge-Kutta, ispitivani su oscilatorni procesi pokretanja prenosa mašinske jedinice sa indukcionim motorom. Da bi se odredio koeficijent izolacije vibracije, izračunat je sistem sa elastičnom spojnicom koja ima linearnu elastičnu karakteristiku....
Ključne riječi: *elastično kvačilo, mehanička povratna informacija, oscilatorni proces, rotaciona masa, startni obrtni moment.*

DEVELOPMENT OF AIRCRAFT MECHANICAL SYSTEMS AND MECHATRONICS MODELING

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The Boeing Company, USA;
Note: The Boeing Company is not associated with this paper

Želimir Husnić

ABSTRACT:
Preliminary design of aircraft mechanical systems is complex process. Aircraft fly-by-wire controls associated with mechanical systems models need to be draw together in an appropriate sequence in order to perform various design studies with high accuracy and efficiency. The paper discuss Mechatronic approach related to this process. Mechatronic approach in design, modeling and simulation offer improvement in overall quality, while decrease cost and time required for development.

Keywords: *aircraft, mechanical systems, hydraulics, development, modelling, simulation, control system, mechatronic, validation*

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1. INTRODUCTION

The physical properties of the product are primary goal for engineering design. Engineering design is the process of designing a system, component, or process to meet desired needs.
Design Process include steps as follows: recognize the need, problem definition, gathering of data, concept, design and analysis, development, testing and manufacturing.
Selection of the aircraft configuration is fundamental to the aircraft conceptual design process including identification of aircrafts functional requirements and interfaces.
The aircraft flight control surfaces allowing regulation and control of the aircraft's flight attitude and permit stable flight. The aircraft mechanical systems enable the flight control surfaces operating and regulation.

CHAIR PRODUCTION AND ROBOTS USAGE

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Zagreb, Croatia

Salah-Eldien Omer

ABSTRACT:
The chair production is one of the complicated wood processing. The design of chairs from the old times is developed many times according to the agronomic recommendations to the chair construction generally a especially for the usage in certain places. The chair construction is also developed from certain shapes to modern ones which could guarantee the good quality and conformability of the product. In the production phases from the mechanical processing to the finishing process many production phases are very complicated and needs very well operating machines with high precision and good quality. Robots were introduced to the chair production before many years but not in most phases. When they started to be used in this process they brought a lot of high productivity and quality in final products.

Keywords: *Chair construction, high quality production of chair elements and less production cost in many chair designs.*

SAZETAK:
Proizvodnja stolica smatramo se kompliciranom obradom msivnog drveta. Design stolica od davnih vremena razvijeno je na bazi argonamiske preporuke konstrukcija stolica posebno pri uptrebi na odredenim mijestima.Konstrukcija stolica uvjek je razvijena na osnovu niza starih stolica koje su koriscene u starnim vremenama ali u novom obliku koji grantira dobru kvalitetu i udobnost.Pri samoj proizvodnji stolica od osnovne mehanicke prerade do finisiranja,niz tih faza su komplicirane i trebaju soficirane strojeve sa visokom preciznosco.Roboti su uvedeni u tom procesu prije niz godina ali ne na svim fazama proizvodnje.Kod nijhove primjene pri proizvodnji stolica, donjeli su visoku prodoktivnost i kvalitetu u finalnom proizvodu.

Kljucne riječi*: Konstrukcija stolica,visoke kvaliteta proizvodnje elementa stolice,manji troskovi proizvodnje.*

POWER PARAMETERS OF MICRO-CUTTING DURING FINISHING ANTI-FRICTION NON-ABRASIVE TREATMENT

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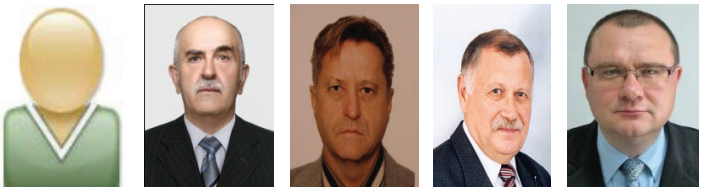

I. Shepelenko Y. Nemyrovskyi Y. Tsekhanov E. Posviatenko S. Sardak

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ABSTRACT:
Based on the method of the theory of similarity and dimensions using a model experiment, we studied the effect of the force parameters of the finishing anti-friction non-abrasive treatment (FANT) on the micro-cutting process depending on the conditions of contact interaction, which allows a reasonable approach to the formation of an anti-friction coating by the friction-mechanical method. From the standpoint of process mechanics, the role of power parameters on the patterns of micro-cutting is considered. Methods and devices have been developed that allow the simulation of the FANT process, with a phased study of micro-cutting and adhesive sticking of antifriction material on the treated surface. A relationship is established between the force exerted on the surface being machined, the geometry of the microprotrusion, as well as the cutting depth, the application of which allows the use of the methods of the theory of similarity and dimensions to obtain a dimensionless value of force. An analytical relationship has been established to determine the strength for various materials and cutting conditions when applying FANT coatings. Ways to increase the efficiency of the micro-cutting process by providing optimal values of the cutting front angle are indicated. It has been experimentally proved that with an increase in the force of pressing the tool against the work surface to the set value, the continuity of the antifriction coating increases.

Keywords: *finishing anti-friction non-abrasive treatment, micro-cutting, power, front angle, contact interaction, coating.*

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1. INTRODUCTION

One of the most important and urgent problems of modern engineering is the development and widespread use of new, scientifically sound, environmental, technically and economically feasible processing technologies in order to improve the quality of work surfaces by achieving optimal performance properties.

THE USE OF DIGITAL FACTORY TECHNOLOGIES IN SLOVENIAN MANUFACTURING COMPANIES

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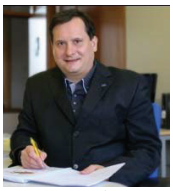
Faculty of Mechanical Engineering, University of Maribor, Maribor, Slovenia


Iztok Palčič


Simon Klančnik


Tone Lerher


Mirko Ficko

ABSTRACT:
This paper deals with the use of advanced manufacturing technologies in Slovenian manufacturing companies in the light of Industry 4.0. The main objective of the paper is to determine the adoption of specific advanced manufacturing technologies, such as digital factory technologies, 3D manufacturing technologies and use of specific types of robots. At the same time, we present a possible Industry 4.0 readinessindex and assess Industry 4.0 readiness of Slovenian manufacturing companies. Results are based on a sample of 118 Slovenian manufacturing companies, whose data were obtained through the 2018/19 European Manufacturing Survey edition. The results are presented with the use of descriptive statistics. Results show that the use of specific advanced manufacturing technologies in Slovenian manufacturing companies is quite diverse and that Industry 4.0 readiness increases.

Keywords: *manufacturing company, advanced manufacturing technology, Industry 4.0, Industry 4.0 readiness index, European manufacturing survey, Slovenia*

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1. INTRODUCTION

Manufacturing is continuously evolving from concept development to methods and tools available for the production of goods for use or sale. Traditionally, manufacturing refers to an industrial production process through which raw materials are transformed into finished products to be sold in the market. However, these days manufacturing is considered to be an integrated concept at all levels from machines to production systems to an entire business level operation [1].

When we speak about manufacturing, we must think about manufacturing technologies, nowadays especially about advanced manufacturing technologies (AMT) and information-communication technologies (ICT). These technologies are a vital part of smart factory that utilize the internet of things (IoT) to realize intelligent manufacturing concepts like predictive maintenance or extensive machine to machine communication [2]. In smart factory products, resources and processes are characterized by cyber-physical systems (CPS) [3].

NEW TECHNOLOGY OF PRINTED CIRCUIT BOARD MICRODRILLING

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V.P. Mikhailov *Tun Lin Aung* *A.V. Kazakov*

ABSTRACT:
The paper describes the new technology principle of high precision drive for blind holes microdrilling into circuit boards. The experimental results of high precision drive based on active magnetorheological elastomer damper usage being inclused into closed control system.

Keywords: *printed circuit board, microdrilling, high-precision drive, active damper, magnetorheological elastomer, closed control system, positioning error, time of the transition process.*

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1. INTRODUCTION

In the technology of multilayer printed circuit board manufacturing the minimal demanded diameter of connecting holes is about 50 microns. Novadays the main drilling instrument manufacturers:(Union Tool (Japan), IND-Sphinx (India), HAM Microprazision (Germany), HPtec (Switherland) show the drilling instruments for the demanded parameters forming [1].

Novadays the instruments for glass-fibre plastic drilling with the mentioned parameters may be used only for FR-4 plastic and for holes wit diameter about 150mic, and the spindle rotor drive is based on air bearing, that rotates with rotor speed 300 -325 thousand rev/min The main manufacturers are: osalux PS300 и PS325 (Switherland)[2], and the drillaveragedurability is about 1000 holes in glass-fibre plastic.

From the another side the bland holes forming is a difficult prosedure bcouse the bottom form of the hole leads to high intensity of drill wear. The hole buttom form is the emergency parameter of the technology, and the drillaveragedurability bacomes about 500-700 holes [2]

DEVELOPMENT OF THE WASTELESS TECHNOLOGY OF PROCESSING OF STEEL-SMELTING SLAGS

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S. Matkarimov B. Berdiyarov

ABSTRACT:
In article questions of development low-waste technologies of processing of steel-smelting slag are considered, gland allowing by extraction and its connections from steel-smelting slag to receive additional raw materials for production became, and the remains to use in building industry. Studying of gravitational methods of enrichment of steel-smelting slag and heat treatment the ore-fuel of pellets is the basis for work.

Keywords: *slag, metallurgical dust, rolling scale, tails of dressing-works, iron, magnetite, fusion mixture, melting.*

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1. INTRODUCTION

The main problem of modern steel-smelting production in the world is complex processing of slag, utilization of valuable components and increase in complexity of use of raw materials. Over time the given problem will increase since every possible exhaustion of the rich and easily opened ore fields, increase in requirements to environmental protection, growth of needs for ferrous metals is observed. Production of ferrous metals is followed by formation of slag and other types of technogenic waste. Their quantity, in connection with rapid growth of smelting of cast iron and steel, continuously increases and now is hundreds of millions tons. It is easy to present what huge areas can be busy with slag dumps. And it when the deficiency of the fertile land plots occupied by the industrial enterprises sharply increases and becomes aggravated situation with protection of natural resources. But it is only one sides of the problem, the second consists in potential opportunities of use of slag in the national economy [1].

Complex processing of steel-smelting slag as the main way of engineering-ecological development of society, were offered in the mid-sixties the past century, generally by scientists from the CIS countries. On the basis of their application it was supposed not only it is most useful to use the consumed raw material resources, but also to try to process completely formed waste.

OPTIMIZATION OF POLYCHLOROTRIFLUOROETHYLENE PROCESSING TECHNOLOGY BY THE RESPONSE SURFACE METHODOLOGY

OPTIMIZACIJA TEHNOLOGIJE ZA OBRADU POLIHLOROTRIFLUOROETILENA METODOLOGIJOM ODZIVA POVRŠINE

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ABSTRACT:
The influence of the processing conditions on the impact elasticity of polychlorotrifluoroethylene was considered in this article by the response surface methodology (RSM) with design of experiment (DoE). Impact elasticity is chosen as a parameter of optimization, since it is the most sensitive indicator to the changes in parameters of materials formation. It is found that hardening behavior of polychlorotrifluoroethylene is the most important factor that affects the parameter of optimization, because it significantly changes the characteristics of finished products since it reduces the degree of crystallinity of polymer. It is showed that it is possible to control different properties of composites based on polychlorotrifluoroethylene by varying processing conditions and knowing the patterns of the impact of degree of crystallinity on the technical properties of polymer. ….
Keywords: *polychlorotrifluoroethylene (PCTFE), mathematical modeling, response surface methodology (RSM), design of experiment (DoE).*

SAŽETAK:
Uticaj uslova prerade na udarnu elastičnost poliklorotrifluoroetilena je razmotren u ovom članku metodologijom odziva površine (RSM) sa planiranjem eksperimenta (DoE). Uticaj elastičnosti je izabrana kao parametar optimizacije, jer je najosetljiviji pokazatelj na promene u parametrima formiranja materijala. Otkriveno je da je ponašanje kaljenja poliklorotrifluoroetilena najvažniji faktor koji utiče na parametar optimizacije, jer značajno menja karakteristike gotovih proizvoda jer smanjuje stepen kristalnosti polimera. Pokazano je da je moguće kontrolisati različita svojstva kompozita na bazi poliklorotrifluoroetilena promenljivim uslovima prerade i poznavajući obrasce uticaja stepena kristalnosti na tehnička svojstva polimera. ….
Ključne riječi: *Polihlorotrifluoroetilen (PCTFE), matematičko modeliranje, metodologija odziva površine (RSM), planiranje eksperimenta (DoE).*

ENGINE SPEED AND LOAD EFFECT ON THE SEALING CAPACITY OF A PISTON RING-PACK

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[2]Politecnico di Torino



E. Selmani *C. Delprete* *A. Bisha*

ABSTRACT:
The combustion chamber is ought to be perfectly sealed, however, part of the air and fuel mixture can escape from it. Among the several losses there is the gas flow from the inter-ring crevices, which is always present. This leakage is known as blow-by, and affects efficiency, correct lubrication and emissions. The amount of leakage is dependent on many factors, and among the most important are the engine speed and load, which are able to affect the system through the forces applied on it. The aim of this paper was to understand in a more detailed way how the engine speed and load could affect the sealing efficiency of a ring-pack. For this purpose, a complete range of speeds and loads were used in the simulations. The equations of the ring motions and gas dynamicshas been implemented and solved in ©Ricardo RINGPAK solver. The results showed that inertia and inter-ring gas pressures drives the sealing behavior of the rings. The blow-by trend showed to decrease with the speed and increase with the load, exception made for the idle condition where the values were different to the other cases, especially at higher speeds. Among the two parameters, the engine speed resulted to affect more significantly the blow-by trend.

Keywords: Blow-by, internal combustion engines, speed, load, ring dynamics

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1. INTRODUCTION

The piston and piston-rod mechanism, are powered by the gas pressure obtained from the combustion inside the chamber. In order to allow the piston to move and slide over the cylinder liner, a pack of rings is mounted into the piston crown. The piston rings main duty is to seal off the combustion chamber, however, their tightness is not perfect and part of the intake gas mixture is lost toward the crankcase. This phenomenon is commonly known as blow-by gas, and was recognized to brink negative effects on performances, lubrication and emissions [1-5]. Initial studies [6-7] have analysed the ring motions in the axial direction, further studies [8-9] have also included the motions in the other directions.

DISSEMINATION OF PATENTS OF THE BASE TECHNOLOGIES OF THE FOURTH INDUSTRIAL REVOLUTION - INDUSTRY 4.0

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Isak Karabegović Edina Karabegović Mehmed Mahmić Ermin Husak

ABSTRACT:
The fourth industrial revolution presents a vision of advanced industrial production that is already being implemented by applying new technologies in the automation of production processes, and the exchange and processing of data. In other words, Industry 4.0 integratesthe fourth-generation innovations in production processes and in all segments of society. The patents from Industry 4.0 and their implementation are responsible for Industry 4.0 application. The paper analyzes the application and implementation of Industry 4.0 patentsin the world, with special attention to the European Union and its developed countries. The analysis was also conducted by industry sectors and leading companies in the application and implementation of Industry 4.0 patents. The paper provides the conclusion of the implementation of Industry 4.0 patents.

Keywords: *innovations, patents, Industry 4.0, implementation, Industry 4.0 base technologies, infrastructure, automotive industry*

SAŽETAK:
Četvrta industrijska revolucija predstavlja viziju napredne industrijske proizvodnje koja se već danas djelimično provodi tako što se vrši implementacija novih tehnologije u automatizaciji proizvodnih procesa, razmjenu i obradu podataka, drugim rječima možemo da kažemo da Industrija 4.0 integriše
sledeće inovacije četvrte generacije kako u proizvodnim procesima, tako iu svim segmentima društva. Za implementaciju Industrije 4.0 zaslužni su patenti iz Industrije 4.0 i njigova implementacija. U radu je napravljenja analiza prijave i implementacije patenata iz Industrije 4.0 u svijetu, a poseban osvrt je dat na Evropsku Uniju i njene razvijene zemlje.Analiza je napravljena i po industrijskim sektorima i vodećim kopanijama po prijavi i implementaciji patenata iz Industrije 4.0.Na kraji rada sudati zaključci implementacije patenata iz Industrije 4.0

Ključne riječi: *inovacije, patenti, Industry 40. Implementacija, bazne tehnologije Industrije 4.0,infrastrzktura, automobilska industrije*

IMPACT FORCE LOCALIZATION USING EIGENFREQUENCY MEASUREMENT IN PLANE FRAMES

LOKALIZACIJA UDARNE SILE POMOĆU MJERENJA SOPSTVENIH FREKVENCIJA NA RAVANSKIM RAMOVIMA

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Mostar, Bosnia and Herzegovina


Emir Nezirić *Safet Isić*

ABSTRACT:
Vibration measurement is one of the most used procedures for machine and structure testings and diagnostics. Structures subjected to impact force should vibrate at eigenvibration frequencies. Which eigenfrequencies are excited should be dependent on impact force location. This paper would show the possibility of how vibration measurement on plane frames could be used to determine the location of the impact forces.

Keywords: *structural vibration, impact force, vibration measurement, eigenmodes, eigenfrequencies*

SAŽETAK:
Mjerenje vibracija je jedna od najčešćih procedura testiranja i dijagnostike mašina i struktura. Strukture izložene udarnoj sili vibriraju karakterističnim sopstvenim frekvencijama. Lokacija djelovanja udarne sile bi trebala da utiče na sopstvene frekvencije kojima struktura osciluje. Ovaj rad će prikazati mogućnost upotrebe mjerenja vibracija na ravanskim ramovima kao alata za određivanje lokacije udarne sile.

Ključne riječi: *strukturne vibracije, udarna sila, mjerenje vibracija, sopstveni oblici oscilovanja, sopstvene frekvencije*

CONDITIONS ON FULL ROTATION OF THE DRIVE MEMBER OF THE FOUR-JOINT MECHANISM

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Avdo Voloder *Fikret Veljović* *Senad Burak*

ABSTRACT:
The conditions that must be satisfied for the driving member of the four-joint mechanism to be able to make full rotation and to prevent the movement of this mechanism are analyzed. The analysis is based on observation of the end positions of this mechanism. Mathematical expressions have been obtained that describe these conditions and these expressions are generalizable to any geometry of a four-joint mechanism. These results are also described graphically in the form of diagrams. Several numerical examples of combinations of the lengths of the individual members of the mechanism during its motion are also presented.

Keywords: *four-joint mechanism, mechanism member movement restriction, simulations*

SAŽETAK:
Analizirani su uslovi koji moraju biti zadovoljeni da bi pogonski član četverozglobnog mehanizma mogao da napravi puni okretaj, odnosno da ne bi došlo do blokade kretanja mehanizma. Analiza je zasnovana na posmatranju krajnjih položaja tog mehanizma. Dobiveni su matematički izrazi koji opisuju te uslove, pri čemu su ti izrazi opštevažeći za bilo kakvu geometriju četverozglobnog mehanizma. Ti rezultati su opisani i grafičkim putem u vidu dijagrama.Prikazani su i neki brojčani primjeri kombinacija dužina pojedinih članova mehanizma pri njegovom mogućem kretanju.

Ključne riječi: *četverozglobni mehanizam, ograničenje kretanja mehanizma, simulacije.*

INTEGRATED DEVELOPMENT AND DESIGN OF GEARS REDUCTION DRIVE

INTEGRISANI RAZVOJ I DIZAJN REDUKTORA

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Isad Saric *Jasmin Smajic* *Adis J. Muminovic*

ABSTRACT:
This paper presents the methodology for integrated product development and design. Gears reduction drive was chosen as example. For design process, advance 3D methods and technologies was used, technologies such as: 3D geometric parametric modeling of virtual prototype, simulation of working principles, manufacturing of real prototype using additive manufacturing (3D printing) and usage of augmented reality. In conclusion part of the paper, using results from this research, advantages of integrated product development and design are highlighted, with special focus on influence of this methodology on students education at Faculty of Mechanical Engineering in the field of mechanical power transmissions.

Keywords: *gears reduction drive, simulation, additive manufacturing (3D printing), augmented reality*

SAŽETAK:
U ovom radu prikazan je proces integrisanog razvoja i dizajna proizvoda na primjeru višestepenog reduktora. Pri realizaciji konstrukcionih aktivnosti primijenjene su savremene 3D tehnike i tehnologije: 3D geometrijsko parametarsko modeliranje virtuelnog prototipa i simulacija njegovog kretanja, izrada fizičkog prototipa aditivnom tehnologijom 3D printanja i primjena tehnologije proširene realnosti. U okviru zaključnih razmatranja, a na osnovu pokazatelja do kojih se došlo realizacijom ovog istraživanja, istaknute su prednosti primjene procesa integrisanog razvoja i dizajna proizvoda, s osvrtom na učinak pri edukaciji studenata mašinskih fakulteta u području mehaničkih prenosnika snage.

Ključne riječi: *reduktor, simulacija, atitivne tehnologije (3D printanje), proširena stvarnost*

FINITE ELEMENT ANALYSIS (FEA) OF AUTOMOTIVE PARTS DESIGN AS IMPORTANT ISSUE OF ASSEMBLY TECHNOLOGY DESIGNING OF STEERING AND BREAKING SYSTEM OF PASSENGER VEHICLE

METODA KONAČNIH ELEMENATA KONSTRUKCIJE AUTOMOBILSKIH DIJELOVA KAO VAŽAN FAKTOR PROJEKTOVANJE TEHNOLOGIJE MONTAŽE UPRAVLJAČKOG I KOČIONOG SISTEMA ZA PUTNIČKO VOZILO

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TRA Tešanj Development Agency / University of Zenica, Faculty of Mechanical Engineering

Ismar Alagić

ABSTRACT:
The purpose of this article is to present a procedure to exploitation characterestics optimization of three different automotive parts (wheel hub, ball joint and tie rod) from production programme of Prevent FAD company based on the finite element formulation made by Algor software. This paper's goal is to show that application of FEA is successful in solving assembly technology issue of three different parts form production programe of company Prevent FAD.. These results have the great influence on working function of above mentioned three parts and their application, especially in order to design of assembly technology of steering and breaking system of passenger vehicle.

Key words: *wheel hub, ball joint, tie rod, tensile process, finite element analyse, assembly technology.*

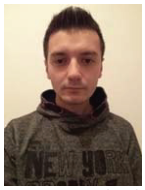
SAŽETAK:
U ovom radu prikazan je proces integrisanog razvoja i dizajna proizvoda na primjeru Svrha ovog rada je prezentovati postupak optimizacije eksploatacionih karakteristika tri različita automobilska djela (glačnina točka, zglog za vođenje, spona) iz proizvodnog programa firme Prevent FAD provođenjem metode konačnih elemenata uz korištenje Algor softvera. Cilj ovog rada je pokazati da je primjena FEA uspješna u rješavanju problema tehnologije montaže gore navedena tri dijelaa iz proizvodnog programa firme Prevent FAD. Ti rezultati imaju veliki utjecaj na radnu funkciju navedena tri proizvoda i njihovu primjenu, posebno u svrhu projektovanja tehnologije montaže upravljačkog i kočionog sistema putničkog vozila.

Ključne riječi: *glavčina, zglob za vođenje, spona, istezanje, analiza konačnih elemenata, tehnologija montaže.*

PROGRAMMING ROBOT KUKA KR 16-2 FOR A PALLETIZING APPLICATION

PROGRAMIRANJE ROBOTA KUKA KR 16-2 ZA PRIMJENU U PALETIZIRANJU

Samir Vojić, Ramiz Sijamhodžić
Technical faculty, University of Bihac, Bihac, Bosnia and Herzegovina

Samir Vojić *Ramiz Sijamhodžić*

ABSTRACT:
This paper presents the robot programming process in the palletization process,as well as an analysis of the results obtained after palletization. The KUKA robot along with an example of programming of this type of robot in the palletization is described. Robot programming is designed to take arbitrarily ordered work pieces onto and stack them on a pallet.Robot programming can be direct and indirect. In this example, direct programming, or programming using a smartPAD pendant, was used for on-site learning.

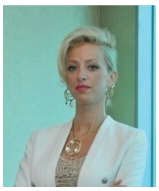
***Keywords*:** robot, KUKA robot, palletization, programming

SAŽETAK:
U ovom radu prikazan je proces programiranja robota u procesu paletizacije, te je data analiza rezultata dobivenog nakon paletizacije. Predstavljen je KUKA robot, i pokazan primjer programiranja ovog tipa robota u procesu paletizacije. Programiranje robota urađeno je za uzimanje proizvoljno poredanih radnih komada i njihovo slaganje na paletu.Programiranje robota može biti direktno i indirektno. U ovom slučaju korišteno je direktno ili programiranje korištenjem smartPAD-a na licu mjesta.

Ključne riječi: *robot, KUKA robot, paletizacija, programiranje*

REINFORCEMENT LEARNING AND MARKOV DECISION PROCESSES IN REHABILITATION

Zlata Jelačić
Faculty of Mechanical Engineering, University of Sarajevo



Zlata Jelačić

ABSTRACT:
Situated in between supervised learning and unsupervised learning, the paradigm of reinforcement learning deals with learning in sequential decision-making problems in which there is limited feedback. This paper introduces the intuitions and concepts behind Markov decision processes and reinforcement learning algorithm for computing optimal behaviours. First the formal framework of Markov decision process is defined, accompanied by the definition of value functions and policies. The main part of the paper focusses on the introduction of foundational classes of algorithms for learning optimal behaviours, based on various definitions of optimality with respect to the goal of learning sequential decisions.
A human–robot interactive control is proposed to control a lower limb prosthetic robot for amputeepatients in the gait rehabilitation training. The rehabilitation prosthetic robot is driven bythe hydraulic system and has two rotational degrees of freedom. An adaptiveadmittance model is adopted considering its suitability for human–robot interaction.

Keywords: *Gait rehabilitation training, prosthetic robot, human–robot interactive control, admittance model, reinforcement learning*

1. INTRODUCTION

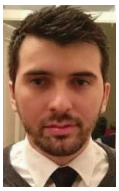
When focussing on motor activities, it is widely accepted that the repetition of sessions of movement therapy plays a key role in the modification of motor outcomes [1]. In this context, robotic devices, due to their ability to improve patients' compliance to treatments, are increasingly being exploited to strengthen and validate training programs directed to improve motor outcomes.
The role of robotic devices in improving motor outcomes during rehabilitation is quite obvious, however the rationale behind clinical efficacy in rehabilitation programswhich include robotic devices, when compared to theconventional ones [2], hasnot been developed in a theoretical framework.

MODELING, ANALYSIS AND SIMULATION OF WORK FOR THE PUNCHING AND CUTTING OPERATIONS ON INNER PLATE OF THE FRONT CAR DOOR

MODELIRANJE, ANALIZA I SIMULACIJA RADA ALATA ZA OPERACIJE PROBIJANJA I ODSIJECANJA NA UNUTRAŠNJEM LIMU PREDNJIH VRATA AUTOMOBILA

Isad Saric[1], Enis Muratovic[1], Harun Music[2]
[1]Department of Mechanical Design, Faculty of Mechanical Engineering, University of Sarajevo, Sarajevo, Bosnia and Herzegovina
[2]PPW Engineering, Sarajevo, Bosnia and Herzegovina





Isad Saric Enis Muratovic Harun Music

ABSTRACT:
In this paper we displayed the problematic ofmodeling, analysing and simulating work process of specific toolused for punching and cuttingoperations on inner plate of the front car door.Basic principles of treating material with deformations are displayed, to easily understand operations that are performed during the work of the tool. Principles of geometric modeling, application of Boolean operations, parametrized individual standard parts and databases are very important factors for tool modeling. Beside modeling it is very important to calculate the specific parts based on standards which are used in car industry.After geometrical modeling of tool, simulation and work analysis have been performedto control the movement speed of the toolduring production. Simulation also enables faster design processfor the tool, increases work safety etc.

Keywords: *tool, modeling, analysis, simulation, CATIA*

SAŽETAK:
U ovom radu izložena je problematika modeliranja, analize i simulacije rada specifičnog alata za operacije probijanja i odsijecanja na unutrašnjem limu prednjih vrata automobila. Izložena su osnovna načela obrade materijala deformacijom, kako bi se jednostavnije shvatile operacije koje se izvode prilikom rada alata. Za modeliranje alata veoma su bitni principi geometrijskog modeliranja, primjena Bulovih operacija, parametrizovani pojedinačni standardni dijelovi, te baze podataka. Pored modeliranja veoma važno jei proračunati karakteristične dijelove alata na osnovu standarda koji se primjenjuju u autoindustriji. Nakon geometrijskog modeliranja, izvršena je simulacija i analiza rada alata, čime je omogućena provjera brzine kretanja alata prilikom obrade. Simulacija također omogućava ubrzanje procesa dizajna alata, povećava pouzdanost njegovog rada itd.

Ključne riječi: *alat, modeliranje, analiza, simulacija, CATIA*

INTELLIGENT CAD SYSTEMS FOR GENERATION G CODE

INTLEGENTNI CAD SISTEMI ZA GENERISANJE G KODA

Senad Rahimić[1], Anida Memić[1]
[1] Faculty of Mechanical Engineering, University of "Džemal Bijedić"in Mostar, Mostar, Bosnia and Hercegovina


Senad Rahimić *Anida Memić*

ABSTRACT:
Computer Aided Design (CAD) systems are now indispensable in many industries, such as mechanical, aeronautical, electrical, architectural, and automobile industries. In this paper show link between a CAD application and an excel file that generates G code. Particularly in mechanical engineering where geometrical information is dominant, CAD has become not optional but necessary.The excel file will use an object-oriented programming method to define the stages of making a finished piece.This paper will show the connection of 3D CAD models with the defined stages of technological process development in order to obtain G code.

Keywords:*intelligent CAD systems, G code, objec, object-oriented programming.*

SAŽETAK:
Računalom podržani dizajn (CAD) danas su neophodni u mnogim industrijama, poput mašinske, vazduhoplovne, elektro, arhitektonske i automobilske industrije. U ovom radu prikazana je veza između CAD aplikacije i excel datoteke koja generira G kod. Posebno je izražena primjena u mašinskoj proizvodnji u kojoj dominiraju geometrijske informacije, CAD je postao neophodan. Excel datoteka će koristiti metoduobjektno orijentiranog programiranja za definisanje faza izrade gotovog komada. Ovaj rad će prikazati povezanost 3D CAD modela sa definiranim fazama razvoja tehnološkog procesa radi dobijanja G koda.

Ključne riječi: *inteligentni CAD sistemi, G kod, objektno-orijentisano programiranje.*

AUTONOMOUS WORK SYSTEMS IN THE CYBER-PHYSICAL PRODUCTION SYSTEMS CONCEPT

AUTONOMNI RADNI SISTEMI U KONCEPTU KIBERNETSKO-FIZIČKIH PROIZVODNIH SISTEMA

***Elvis Hozdić*[1,2]**
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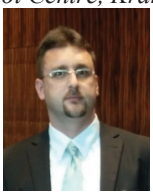
[2]Kranj School Centre, Kranj, Slovenia



Elvis Hozdić

ABSTRACT:
Under the influence of globalization which brings many changes in all spheres of life and in the sphere of industrial production, manufacturing enterprises are forced to adapt their manufacturing structure these challenges in order to promptly and effectively respond to the complex demands of today's market, which is global and less national. Over time, it's developed different concepts of manufacturing systems. They were intended to respond to market demands in a time in which existed. Today, thanks to the developed information-communication technologies (ICT), manufacturing enterprises tend to structure their systems in a spirit of cyber-physical systems (CPS).....
The possibility of implementing the concept of AWS in a spirit of the CPS is presented through industrial example in the production area of high pressure die casting (HPDC).

Keywords: *autonomous work system, cyber-physical production systems, high pressure die casting*

REZIME:
Pod utjecajemglobalizacije, koja donosi mnogobrojne promjene u svim sferama života pai u sferi industrijske proizvodnje, proizvodna preduzeća su prisiljena prilagoditi svoju proizvodnu strukturu tako da mogu brzo i učinkovito odgovoriti na kompleksne zahtjeve današnjega tržišta, koje je sve više globalno i sve manje nacionalno. S vremenom su se razvijali različiti koncepti proizvodnih sistema. Oni su trebali odgovoriti na zahtjeve tržišta u vremenu u kojem su egzistirali. Danas, zahvaljujući razvoju informacijsko-komunikacijskih tehnologija (IKT), proizvodna preduzeća teže da svoje sisteme strukturiraju u duhu kibernetsko-fizičkih sistema (KFS).....
Mogućnost implementacije koncepta ARS strukturiranoga u duhu KFS predstavljena je kroz industrijski proizvodni primjer ulivanja pod visokim pritiskom (HPDC).

Ključne riječi: *autonomni radni sistem, kibernetsko-fizički proizvodni sistemi, ulivanje pod visokim pritiskom*

MICROSTRUCTURE ASSESSMENT OF STEEL FOR ELEVATED TEMPERATURES BY THE REPLICA

PROCJENA MIKROSTRUKTURE ČELIKA ZA RAD NA POVIŠENIM TEMPERATURAMA POMOĆU REPLIKA

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Institute “Kemal Kapetanović” of Zenica, University of Zenica,
Bosnia and Herzegovina


Belma Fakić


Adisa Burić


Edib Horoz

ABSTRACT:
Materials used in thermal power plants are exposed to elevated temperatures in their daily work. Changes in the state of the microstructure of a material are monitored by non-destructive testing methods, that is, by taking a microstructure impression using a replica method. The elevated temperature leads to changes in the material that occur in the appearance of pores along the grain boundaries. Changes in the material and the degree of degradation of material will be presented in this paper.

Keywords: *steel, microstructure, replica, elevated temperature, creep, micropore*

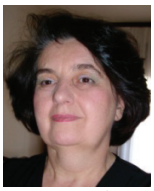
SAŽETAK:
Materijali koji se koriste u termoelektranama izloženi su povišenim temperaturama u svakodnevnom radu. Promjene u stanju mikrostrukture materijala prate se metodama ispitivanja bez razaranja, tj. otiskom mikrostrukture pomoću replike. Povišena temperatura dovodi do promjena u materijalu koje nastaju pojavom pora duž granica zrna. Promjene u materijalu i stepen degradacije materijala bit će prikazane u ovom radu.

Ključne riječi*: čelik, mikrostruktura, replika, povišena temperatura, puzanje, mikropore*

APPLICATION THE METHOD DIGITAL IMAGE CORRELATION FOR MEASUREMENT OF SMALL DEFORMATIONS AT THE BEGINNING OF PLASTIC FLOW OF MATERIALS

PRIMJENA METODE DIGITALNA KORELACIJA SLIKE ZA MERENJE MALIH DEFORMACIJA NA POČETKU PLASTIČNOG TOKA MATERIJALA

StojaRešković, Tin Brlić, Filip Skender
University of Zagreb Faculty of Metallurgy, Sisak, Croatia


Stoja Rešković


Tin Brlić


Filip Skender

ABSTRACT:
This paper presents the results of the investigation of very small deformations at the very beginning of the plastic flow of the material. The studies were performed on low carbon microalloyed steel with 0.035% niobium. The tests using the digital image correlation (DIC) method were performed. The measurements by static tensile test using a digital camera at variable strain rates were carried out. The measurement results by Match ID software were analyzed. The stretching rates at the beginning of the plastic flow are affecting the amount and deformation distribution in the deformation zone.

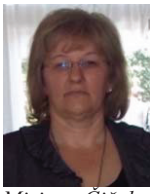
Keywords: *digital image correlation (DIC), deformationzone, small deformation, microalloyed steel.*

SAŽETAK:
U ovom radu prikazani su rezultati istraživanja vrlo malih deformacija na samom početku plastičnog toka materijala. Istraživanja su provedena na nskougljičnom čeliku mikrolegiranom s 0.035% niobija. Ispitivanja su provedena metodom digitalne korelacije slike (DIC). Mjerenja su provedena statičkim vlačnim pokusom uz upotrebu digitalne kamere pri različitim brzinama deformacije. Rezultati mjerenja analizirani su softverom MatchID Brzina razvlačenja ima utjecaj na početak plastičnog toka i raspodjelu deformacija u zoni deformacije.

Ključne riječi: *digitalna korelacija slike (DIC), deformacijska zona, mala deformacija, mikrolegirani čelik.*

APPLICATION OF RFID TECHNOLOGY FOR BETTER EFFICIENCY OF RESOURCE PLANNING

Gordana Zeba[1], Mirjana Čičak[2]
[1]Mechanical Engineering Faculty in Slavonski Brod,
[2]Josip Juraj Strossmayer University of Osijek

Gordana Zeba *Mirjana Čičak*

ABSTRACT:
Industry 4.0 has a significant impact on global manufacturing and the transformation of business processes. Manufacturers have to adapt fast to the requirements of Industry 4.0, due to increasing competition in the global market and the necessity for mass customized products. The main goal of Industry 4.0 is a smart factory and to achieve this goal is a particularly important integration (horizontal, vertical, end-to-end). RFID technology (as wireless automatic identification technology that facilitates tracking and traces of resources) is one of the technologies that support the Internet of Things which is crucial for Industry 4.0 and integration. Efficient resource planning is one of the challenges of Industry 4.0, and integration of the Manufacturing Execution System (MES) and Enterprise Resource Planning (ERP) within the enterprise, as well as the integration with the business partners (suppliers and customers), is indispensable. Modern ERP systems facilitate efficient management of business processes and resources (such as people, machines, materials), concerning all data within the enterprise and throughout the value chain. The application of RFID technology is of great importance for the acquisition of real-time information needed to make management decisions. The goal of this paper is to present trends in the research and advantages of the application of Radio-frequency Identification (RFID) technology for better efficiency of resource planning.

Keywords: *RFID, ERP, Industry 4.0, integration*

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1. INTRODUCTION

The rapid progress of manufacturing and information and communication technologies and their introduction into production has led to the fourth industrial revolution. New technologies such as Big Data Analytics, Cloud Computing, Artificial Intelligence, Wireless Sensor Networks, Internet of Things and Internet of Services form the basis of the Industry 4.0 paradigm. The Internet of Things is one of the key technologies that support Industry 4.0. Industry 4.0 is a technology framework that emphasized the importance of facilitating vertical, horizontal and end-to-end integration for Smart Factory.

STATE OF THE ART IN ADDITIVE MANUFACTURING OF GAS TURBINE COMPONENTS

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[1,2,3]Siemens Energy AB SE-612 83 Finspong, Sweden


P. Avdovic


M. Galijasevic


A. Graichen

ABSTRACT:
The State of the art in Additive Manufacturing (AM) as method with a potential to fundamentally change the development and production of components is presented and real cases in the area are given. Currently, Siemens Energy is using this technology for prototyping, manufacturing, repair of gas turbine components, and spare part manufacturing [1-3]. Additive manufacturing is considered a new revolutionary method and is an integral part of Industry 4.0 which has contribution to a major change in the manufacturing process. It is often very affordable for OEMs (Original Equipment Manufacturers), and at the same time contributes to the very rapid fabrication and repair of gas turbine components, where certain functionalities and performance features are improved. Siemens implements AM technology for repairing gas turbine components for the SGT-700 and SGT-800 industrial gas turbine burners. During implementation period, it was shown that the replacement of conventional repair with AM led to a significant reduction in repair time. Another successful application of AM technology at Siemens is the production of an advanced vortex burner for the SGT-750 industrial gas turbine. In many cases, AM was the only technology that made it possible to produce complicated components [4].
The development of this method is largely based on a very close collaboration between universities, research institutes and industry. These three factors are the main pillars for rapid and successful development where theoretical knowledge from the University are tested, validated and implemented in industry. Cooperation is carried out in the form of projects or special tasks which are public funded and supported by the direct contribution from the industry. Digitalization plays a central role.

Keywords: *Additive Manufacturing, Powder, Digitalization, Digital Twin, Robotics and Automatization, Gas Turbines spare parts, obsolete components, university cooperation*

STRUCTURAL ANALYSIS OF DIRECT PASSIVE PRESSURE REDUCING VALVES USING MODIFIED KINEMATIC GRAPHS

STRUKTURNA ANALIZA DIREKTNOG PASIVNOG PRITISKA VENTILA KORIŠTENJEM MODIFIKOVANIH KINEMATSKIH GRAFOVA

Zhang Yiheng[1], Ihor Sydorenko[1], Volodymyr Tonkonogyi[1], Liubov Bovnegra[1], Predrag Dašić[2]
[1] Odessa National Polytechnic University (ONPU), Odessa, Ukraine
[2] High Technical Mechanical School of Professional Studies, Trstenik, Serbia,


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I. Sydorenko

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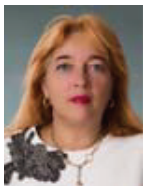
L. Bovnegra

P. Dašić

ABSTRACT:
Structural analysis is the primary stage in the design of any mechanical system, which completely determines the effectiveness of its application in various fields of technology. One of the most effective tools for solving this problem is graph theory, which provides a convenient device for modeling structural properties of systems and relationships between objects of diverse nature. In this paper has conducted research related to testing the theory of modified kinematic graphs for the analysis of existing designs of direct pressure reducing valves with manual control. The methodology of the transition from the actual design of the pressure reducing valve to its model in the form of a modified kinematic graph is shown. Based on the equilibrium equation for the device in question, which determines its operability, the adequacy of the obtained model was verified. …
Keywords: *pressure reducing valve, mechanical structure, structural analysis, kinematic graph, adjacency matrix.*

SAŽETAK:
Strukturna analiza je primarna faza u dizajnu bilo kog mehaničkog sistema, što u potpunosti određuje efikasnost njegove primene u različitim oblastima tehnologije. Jedno od najefikasnijih alata za rešavanje ovog problema je teorija grafova, koja pruža pogodan uređaj za modeliranje strukturnih svojstava sistema i odnosa između objekata različite prirode. U ovom radu je sprovedeno istraživanje vezano za ispitivanje teorije modifikovanih kinematičkih grafova za analizu postojećih dizajna ventila za direktno smanjenje pritiska sa ručnim upravljanjem. Prikazana je metodologija prelaska sa stvarnog dizajna ventila za smanjenje pritiska u njegov model u obliku modifikovanog kinematskog grafikona. Na osnovu jednačine ravnoteže za predmetni uređaj, koja određuje njegovu operativnost, verifikovana je adekvatnost dobijenog modela. …
Ključne riječi: *ventil za smanjenje pritiska, mehanička struktura, strukturna analiza, kinematski graf, matrica susedstva*.

OVERVIEW OF MOBILE APPLICATIONS FOR CNC PROGRAMMING

PREGLED MOBILNIH APLIKACIJA ZA CNC PROGRAMIRANJE

Dragi Tiro, Anida Memić
Džemal Bijedić University of Mostar, Mostar, Bosnia and Herzegovina


Dragi Tiro *Anida Memić*

ABSTRACT:
This paper describes free application software designed for smartphones running Android. In recent years, more such applications have emerged and are classified here into three groups: simulation software, learning software and CNC engraving software. The paper describes some typical applications for these three types of software.

Keywords: *CNC programming, application software, smartphone*

SAŽETAK:
U ovom radu su opisane besplatni aplikaciski softveri namijenjeni smartphone uređajima koji rade sa operativnim sistemom Android. U posljednjih nekoliko godina pojavilo se više ovakvih aplikacija i one su ovde svrstane u tri grupe: softveri sa simulacijom, softveri za učenje i softveri za CNC graviranje. U radu su opisane neke karakteristične aplikacije za ove tri vrste softvera.

Ključne riječi: *CNC programiranje,aplikaciski softveri, smartphone uređaji*

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1. INTRODUCTION

In the last fifteen years, there has been a rapid development and use of smartphones, which are real computers because they have a processor, memory, input and output hardware devices, as well as software. Of course, engineers are increasingly using these devices in practice.Application software (mobile applications) has been increasingly used in recent years with the development of smartphones. A large number of mobile applications for CNC programming have also emerged. This paper will analyse free apps for the Android operating system, which is the most popular mobile OS today.

MODELLING OF CUTTING FORCES IN HARD STEEL TURNING

MODELIRANJE SILA REZANJA PRI STRUGANJU OJAČANOG ČELIKA

Pavel Kovač[1], Mirfad Tarić[2], Bogdan Nedić[3], Borislav Savković[1], Dušan Golubović[4], Dušan Ješić[5]
[1]Department for Production Engineering, Faculty of Technical Sciences, University of Novi Sad,
[2]Srednja škola metalskih zanimanja, Sarajevo, Bosnia and Hercegovina
[3]Faculty of Engineering, University of Kragujevac, Serbia
[4]Faculty of Mechanical Engineering, University of East Sarajevo, Bosnia and Hercegovina,
[5]International Technology and Management Academy – MTMA, Novi Sad, Serbia






Pavel Kovač Mirfad Tarić Bogdan Nedić Borislav Savković Dušan Golubović Dušan Ješić

ABSTRACT:
The aim of this study is to investigate the effect of machining parameters on cutting resistance during hard steel turning. This paper describes a novel approach in cutting resistance modelling using a design experiment. The output of the processing should take into account the cutting resistance they measured when testing the range of speeds, displacements, and depth of bursting. Mathematical models have been obtained that have been shown to have high confidence that they can approximate the measurement results. The connection between cutting forces in terms of changing the parameters of the cutting mode, as well as the undesirable occurrence and wear of the tool, which is certainly present in the process of removing hard-working material, is given.

Keywords: *hard steel, turning, design experiment, cutting forces*

SAŽETAK:
Cilj ove studije je ispitivanje uticaja parametara obrade na površinsku završnu obradu tokom struganja tvrdog čelika. U ovom radu je opisan novi pristup u modeliranju otpora rezanja koji koristi dizajn eksperimenata. Kao izlazna karakteristika procesa obrade uzeti su otpori rezanja koji su se merili u ispitivanom opsegu brzina, pomaka i dubini razanja. Dobijeni su matematicki modeli koji su pokazali da sa velikom sigurnoscu mogu da aproksimiraju rezultate meranja. Dat je osvrt na povecanje sila rezanja u pogledu promene parametara rezima rezanja kao i nezeljene pojave, odnosno habanje alata, koje je svakako prisutno pri procesu skidanja teskoobradivog materijala.

Ključne riječi: *ojačani čelik, struganje, dizajn eksperiment, sile rezanja*

HARDNESS PREDICTION MODEL FOR DRAWING WITH WALL THICKNESS REDUCTION

MODEL PREDVIĐANJA TVRDOĆE KOD IZVLAČENJA SA REDUKCIJOM DEBLJINE ZIDA

Himzo Đukić[1], Mirna Nožić[2]
[1]University of Mostar FSRE
[2]University “DžemalBijedić” of Mostar, Faculty of Mehanical Engineering


Himzo Đukić


Mirna Nožić

ABSTRACT:
Deep drawing with a reduction in the thickness of the wall with a change in the cross section of the workpiece, starting from its bottom to the top, leads to hardening of the material and increase its hardness. As the thickness of the wall decreases, a constant increase in hardness ensures a stable process without interruption of workpieces. By measuring the hardness at the characteristic points at the outer diameter, experimental values were obtained, on the basis of which a model for hardness prediction was derived. The model makes it possible to determine the hardness in all sections to the top of the workpiece, if its geometry is known.

Keywords:*model, hardness, deep drawing with reduction of wall thickness, cross section contraction, section geometry*

SAŽETAK:
Kod dubokog izvlačenja sa redukcijom debljine zida sa promjenom presjeka radnog predmeta, počev od njegovog dna do vrha, dolazi do očvršćavanja materijala i rasta njegove tvrdoće. Obzirom da se debljina zida smanjuje, stalan rast tvrdoće obezbjeđuje stabilan proces, bez prekida radnih predmeta. Mjerenjem tvrdoće u karakterističnim tačkama na spoljašnjem prečniku dobivene su eksperimentalne vrijednosti, na osnovu kojih je izveden model za predviđanje tvrdoće. Model omogućava da se na osnovu mjerenja tvrdoće na prelazu omotača u dno radnog predmeta, odrede tvrdoće u svim presjecima do vrha radnog predmeta, ako je poznata njegova geometrija..

Ključne riječi:*model,tvrdoća, duboko izvlačenje sa redukcijom debljine zida, kontrakcija poprečnog presjeka, geometrija presjeka*

DETERMINATION OF RELAXATION AND CREEP MODULUS OF POLYMER MATERIALS OBTAINED BY 3D PRINTING

ODREĐIVANJE MODULA RELAKSACIJE I PUZANJA POLIMERNIH MATERIJALA DOBIJENIH 3D PRINTANJEM

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ABSTRACT:
Typically, Prony series viscoelastic models are used to obtain the so-calle. "Master" curves in analytical form from experimental results. However, the process of fitting experimental results with the Prony model requires prior knowledge of the model's time parameters, in order to fit into the appropriate module. In this paper, parameter optimization was used in such a way that all the parameters in the Prony series for (Ei, τi determined by a simple least squares method. An example was chosen for this paper to demonstrate parameter optimization for Prony's relaxation module model and the data was used from an available article, while an experiment using a constant ramp test was performed to determine the creep module. The previous experiment was done for real ABS plastic material (Acrylonitrile butadene styrene).

Keywords: *Viscoelasticity, Relaxation, ABS plastic, 3D printing*

SAŽETAK: *Uobičajeno, viskoelastični modeli bazirani na Pronyjevoj seriji koriste se za dobijanje tzv. “master” krivih u analitičkoj formi iz eksperimentalnih rezultata. Međutim, postupak aproksimacije eksperimentalnih rezultata (“fittovanje”) sa Prony-jevim modelom zahtijeva prethodno poznavanje vremenskih parametara modela □, kako bi se uklopio u odgovarajući modul. U ovom radu korištena je optimizacija parametara na način da su svi parametri u Prony-jevoj seriji za (E_i, □□□ određivani pomoću jednostavne metode najmanjih kvadrata. Za ovaj rad je odabran primjer kako bi se pokazala optimizacija parametara za Prony-jev model relaksacijskog modula a podaci su korišteni iz dostupnog članka, dok je za određivanje modula puzanja urađen eksperiment koji kao opterećenje koristi funkciju konstantnog povećanja („ramp-test“). Prethodni eksperiment je urađen za stvarni materijal ABS plastika (Akrilonitril butaden stiren).*

Ključne riječi: *Viskoelastičnost, Relaksacija, ABS plastika, 3D printanje*

ADDITIVE MANUFACTURING OF THE SUPERALLOY TURBINE BLADES BY SELECTIVE LASER MELTING: SURFACE QUALITY, MICROSTRUCTURE AND POROSITY

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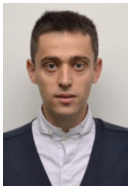


D. Lesyk S. Martinez V. Dzhemelinkyi A. Lamiki

ABSTRACT:
The laser additive manufacturing technology is studied that applies lasers to fabricate the complexly shaped parts by successive selective melting of the metal powder in a layer by layer process. The turbine blade test parts were manufactured by the selective laser melting (SLM) process using an Inconel 718 powder. A multidirectional scanning strategy was used during SLM. The paper is focused on the study of the surface features and material characteristics of the SLM-printed parts. The surface texture supplemented by roughness profile parameters is analyzed. The microstructure, material compositions, material phases, porosity, and hardness in the near-surface layers are also addressed. Microstructural studies were performed by the X-ray diffraction analysis, optical microscopy, and scanning electron microscopy. Results indicated that partially melted powder particles, balling, and signs of the laser tracks are formed on the side surfaces of SLM-built turbine blades. The columnar dendritic microstructure mainly consists of a base γ-phase matrix and $\gamma^{||}$-phase precipitates. The SLM-built turbine blade parts show the accumulation of porosity close to the surface.

Keywords: *metal additive manufacturing, selective laser melting, Inconel 718 powder, turbine blade, surface texture, microstructure, porosity, hardness*

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1. INTRODUCTION

The metal additive manufacturing (or three dimensional (3D) printing) technology is applied for producing 3D objects by melting fine metal powders or wire layer by layer from a computer-aided design (CAD) model of the part. The additive manufacturing techniques allow producing the complex 3D part geometries with high precision, which is difficult or impossible to realize using conventional methods such as machining, casting or forging metals. The microstructure and properties formed by additive manufacturing technology differ from the conventionally manufactured parts [1–3].

IMPORTANCE OF ADDITIVE MANUFACTURING TECHNOLOGY FOR STARTUP LAUNCHING: A CASE STUDY

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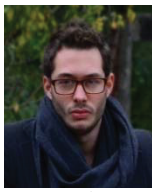

M. Djukanovic *L. Radunovic* *P. Vujovic* *A. Konatar*

ABSTRACT:
Additive manufacturing or 3D printing technology enables building objects using a computer-aided design (CAD) model while successively adding material layer by layer.Recently the number of world's successfully launched startups based on additive 3D printing process is growing. In this paper we present startup launching in Montenegro based on3D printing while creating sustainable zero-waste fashion accessories supported by a mobile application that will enable customers to create and order custom-made products.

Keywords: *additive manufacturing, 3D printing, 3D application, startup*

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1. INTRODUCTION

The additive manufacturing process more often called 3D printing is one of the most revolutionary technologies of this century.The 3D printing process builds three-dimensional objects using a computer-aided design (CAD) model while successively adding material layer by layer and for that reason it is also called additive manufacturing. Recently 3D printing performs crucial roles in many applications, with the most important being manufacturing, medicine, architecture, art and design [1], [2], [3], [4].The main disadvantage of 3D printing, for a long time, was high entry costs not allowinga profitable implementation to mass-manufacturers. However, the market for 3D printing hasshown some of the quickest growth within the manufacturing industry.
The initial idea of employing 3D printing was to create a faster alternative of prototyping. A big advantage of using 3D printing is its versatility and flexibility, which makes it perfect for small-scale manufacturing, for example of spare parts. Investing in 3D printing technology can help iterate and improve prototype design. Also, it allows companies to produce products on a case-by-case basis.

REVERSE ENGINEERING USING 3D SCANNINGAND FEM ANALYSIS

REVERZIBILNO INŽENJERSTVO POMOĆU 3D SKENIRANJA I FEM ANALIZE

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ABSTRACT:
A reverse engineering process of a part including 3D scanning, CAD modeling and FEM analysis is presented in the paper. A cast bearing support has been selected as an example part for the investigation. The final goal of the investigation was to determine maximal allowable radial bearing load of the part. The parametric solid model necessary for the FEM was designed in CAD software using polygonal surface model of a part obtained by 3D scanning and subsequent data processing in 3D scanning software. A handheld scanner working on structured light principle was used for the scanning. The direction and intensity of the maximal allowable force was determined via FEM simulations in which different loading configurations were varied.

Keywords: *3D scanning, CAD, FEM, reverse engineering*

SAŽETAK:
U ovom radu prikazan je proces reverzibilnog inženjerstva koji uključuje 3D skeniranje, CAD modeliranje i FEM analizu. Kao primjer dijela za istraživanje je odabran liveni oslonac ležaja. Krajnji cilj istraživanja je bio odrediti maksimalno dopušteno radijalno opterećenje dijela. Parametarski model dijela neophodan za FEM je izrađen u CAD softveru koristeći poligonalni površinski model dobiven pomoću 3D skeniranja i naknadne obrade rezultata u softveru za 3D skeniranje. Za skeniranje je korišten ručni skener koji radi na principu strukturiranog svjetla. Pravac i intenzitet maksimalne dopuštene sile je određen pomoću FEM simulacija u kojima su mijenjane različite konfiguracije opterećenja.

Ključne riječi: *3D skeniranje, CAD, FEM, reverzibilno inženjerstvo*

HSLA STEEL - SIMULATION OF FATIGUE

HSLA ČELIK – SIMULACIJA ZAMORA

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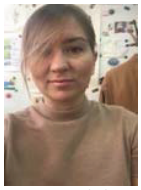
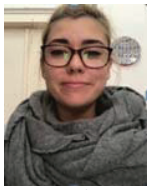


Vujadin Aleksić Bojana Aleksić Ana Prodanović Ljubica Milović

ABSTRACT:
In present paper, based on the results of the experimental study of the behaviour of the samples made of a HSLA steel, in the form of round smooth specimens (RSS) under LCF conditions (with controlled and completely reversible strain $\Delta\varepsilon/2$ = const, $R_\varepsilon = \varepsilon_{min} / \varepsilon_{max}$ = -1, according to ISO 12106: 2003 (E)) and square specimens (SqS) under conditions of HCF conditions (with controlled one-way variable load on tension with σ_{min} = const, according to ISO 12110-1:2013), a computational stress analysis was performed using the FE method and the behaviour of this steel in the fatigue behaviour simulation (LCF and HCF) in SolidWorks programme was shown.
On the basis of the performed analysis of the results of the stress-strain state and the determination of the life using the life isolines for a particular load cycle involving the entire RSS ligament, i.e. SqS for a particular load in a wide range of LCF and HCF loads and ....

Keywords: *HSLA, LCF, HCF, FEM, simulation, ligament*

SAŽETAK:
U radu je na osnovu rezultata eksperimentalnog istraživanja ponašanja uzoraka od niskolegiranog čelika povišene čvrstoće (HSLA), u obliku okrugle glatke epruvete (OGE) u uslovima niskocikličnog (LCF) (sa kontrolisanom i potpuno reverzibilnom deformacijom ($\Delta\varepsilon/2$ = const , $R_\varepsilon = \varepsilon_{min}/\varepsilon_{max}$ = -1, prema standardu ISO 12106:2003 (E)) i kvadratne epruveta (KvE) u uslovima visokocikličnog (HCF) zamora (sa kontrolisanim jednosmerno promenljivim opterećenjem na zatezanje sa σ_{min} = const, prema standardu ISO 12110-1:2013), izvršena računska analiza naprezanja primenom metode konačnih elemenata (MKE) i prikazano ponašanje ovog čelika pri simulaciji zamornog ponašanja (LCF i HCF) u programu SolidWorks.
Na osnovu izvedene analize rezultata naponsko-deformacionog stanja i određivanja životnog veka preko izolinija životnog veka za određeni ciklus opterećenja koje zahvataju čitav ligament OGE, odnosno KvE za određeno opterećenje u širokom spektru opterećenja LCF i HCF i ....

Ključne riječi: *HSLA, LCF, HCF, MKE, simulacija, ligament*

IONIC LIQUIDS AS WIDE TEMPERATURE RANGE LUBRICANT

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Darko Lovrec *Vito Tič*

ABSTRACT:
Over the past few years, the term 'ionic liquid as super lubricant' has been appeared into lubricant expert conversations with growing importance. They have been designed as green, environment friendly technical fluid for use under harsh operational condition and to cope with the environment conditions. In addition to exceptional lubricating and other important physical and chemical properties, they also have excellent temperature stability. For this reason they are extremely suitable for use as a liquid lubricant, i.e. as a hydraulic fluid.
In this paper, the focus is on those fluid physico-chemical properties which affect the hydraulic system temperature operating range – on the viscosity and Viscosity Index. In the forefront of discussion are the latest findings linked to the excellent viscosity temperature behaviour oftested ionic liquids, appropriate for use as energy saving, wide temperature range, green lubricants within hydraulic systems. Their excellent viscosity-temperature properties are confirmed on the basis of standard test procedure. In comparison to conventional mineral based oils or synthetic lubricants, the results regarding viscosity dependence on temperature are much better.

Keywords: *lubricants, ionic liquids, viscosity, viscosity index, temperature range*

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1. INTRODUCTION

Lubricants used within different technical systems, machines and devices, are often discussed asa most important machine part. They are an extremely important component of a variety of gear drives, bearing systems, as well as hydraulic systems, used widely in stationary and mobile machinery,operating underdifferent temperature conditions.When selecting the proper lubricant for a specific application, the tribological system must be identified to its fullest extent. This includes the type of motion, speeds, loads, and the temperaturesoperating environment.The latest is of the utmost importance when it comes to hydraulic fluids.

Lubricants used as a hydraulic fluidneed to be suited for gear,piston and vane hydraulic pumps used within stationary production machines, and for marine, woodlands, mining and other mobile hydraulic systems.

RETROFITTING TECHNIQUES FOR AGRICULTURAL MACHINES

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ABSTRACT:
Intelligent machines and systems are critical elements for future integrated infrastructures based on human-machine interaction and information sharing. To achieve this, it is necessary to design and build a new generation of machines and systems capable of interacting as nodes of the same network. However, this revolution has the limitation of condemning all the machines already on the market to obsolescence. In this work, a retrofitting activity is reported on a tracked vehicle to make the vehicle capable of carrying out operations independently. The goal is to create a machine for agricultural applications, capable of assisting harvesting operations in mountainous areas in the presence of steep terrain, preserving the operator from any risk.

Keywords: *retrofitting, machine design, automation, control systems, robotics*

1. INTRODUCTION

The interest in unmanned guided vehicles (UGVs) or systems (USs), more in general, is growing at a constant rate. Many universities and companies are investing a lot of effort in R&D of UVSs for many sectors, and new applications are presented nearly every day. Among all, the authors are particularly interested in the use of autonomous systems for security and monitoring activities and applications in agriculture. In literature, it is possible to find many examples of robotic applications for agriculture for medium-large machinery for applications in large plots of land. In fact, for some time now, machines capable of working in the open field independently and systems for the automation of stables have been available on the market [1]. These machines, with a non-trivial cost, allow increasing the level of automation of farms allowing them to be competitive on the market.

However,very little has been done concerning small machines for steep terrain or mountainous areas where economies of scale cannot be exploited, and the risk for the operator is very high. For this second type of machine, the market offers few solutions with a not very reduced cost, which, therefore, cannot make space in the economic contexts where the labor cost is decidedly low.

IMPROVING THE AUTOMATED DESIGN EFFICIENCY: A CASE STUDY

POBOLJŠANJE AUTOMATSKE EFIKASNOSTI DIZAJNA: STUDIJA SLUČAJA

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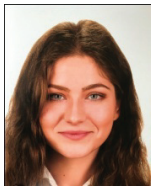
N. N. Kutin


Y. L. Maslennikova

ABSTRACT:
Automation and digitalization has many advantages for engineering, but the authors raise the problem that automation of design processes is not always effective. The purpose of the article is to investigate the cycle generated by design automation and to determine the management impacts that will lead to increasing of automation efficiency. The authors constructed a cognitive model of automotive design processes on the example of PJSC "Avtodiesel", calculated changes of the system components in the dynamics and identified the factor that needs management influence.

Keywords: *Automation and digitalization, automotive design, cognitive model.*

SAŽETAK:
Automatizacija i digitalizacija imaju brojne prednosti za inženjering, ali autori postavljaju problem što automatizacija dizajnerskih procesa nije uvek efikasna. Svrha članka je istražiti ciklus nastao automatizacijom dizajna i utvrditi uticaje upravljanja koji će dovesti do povećanja efikasnosti automatizacije. Autori su na primeru PJSC "Avtodiesel" konstruisali kognitivni model procesa dizajniranja automobila, izračunali promene komponenti sistema u dinamici i identifikovali faktor na koji treba uticaj menadžmenta.

Ključne riječi: *Automatizacija i digitalizacija, automobilski dizajn, kognitivni model.*

MONITORING OF PHYSICAL PROPERTIES OF TRANSMISSION-HYDRAULIC FLUID BY SIMULATING THE OPERATION LOAD OF AGRICULTURAL MACHINE´S HYDRAULIC PUMP UNDER LABORATORY CONDITIONS

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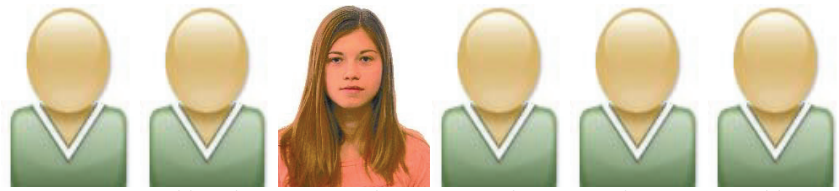

L. Hujo J. Jablonický R. Janoušková J. Kosiba Z. Tkáč J. Tulík

ABSTRACT:
This work describes the results of changes in physical properties of transmission-hydraulic fluid during simulation of operating load of FHD 17 under laboratory conditions, while monitoring the effect of quality changes of the used fluid on the flow efficiency of the hydraulic pump.Aforementioned hydraulic pump is used in hydraulic system of agricultural machine. Laboratory testing equipment allows us to simulate the operational load of the working circuit of the agriculturemachine's hydraulic system with the possibility of testing the operating fluidsand the main elements of the hydraulic system. Hydraulic pump flow rate changes were monitored at precisely determined intervals and the influence of the physical properties of the fluid on the flow efficiency was rewieved and consequently evaluated by mathematical – statistical analysis.

Keywords: *laboratory testing, hydraulic pump, hydraulic system, ecological fluid, hydraulic pump flow*

1.INTRODUCTION

Hydraulic fluids are power carriers in hydraulic system of agricultural machinery and manufacturers of these fluids must take into account specific requirements for improving their quality while reducing the environmental burden while using them in the mobile machinery[1, 2]. Production of the fluid of required quality with acceptable price is becoming increasingly difficult thus creates the opportunity to use fluids with accordance to strict performance specification. Simulateously, the mean time of the oil filling change is monitored with the aim of extending the oil filling change interval [3, 4]. The change of the physical – chemical properties of transmission – hydraulic fluid is an important indicator of the technical condition of the hydraulic pump and fundamentally influences the operation of the individual elements of the hydraulic circuit. The evaluation of the oil filling condition is performed either in pre–scheduled intervals or continuously[5, 6, 7].

PSO OPTIMIZED FUZZY CONTROLLER FOR MOBILE ROBOT PATH TRACKING

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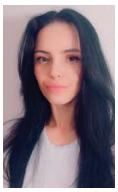

L. Banjanovic-Mehmedovic A. Baluković

ABSTRACT:
An essential aspect of Industry 4.0 is autonomous production methods, powered by Industry of Things (IoT) based on a connected mesh of objects, devices and computer machines, which can communicate with each other. Many things can be transported across the factory via autonomous mobile robots, avoiding obstacles and coordinating with other robots. Autonomous robots are fully integrated with the manufacturing system in Industry 4.0 to a greater extent than ever before. This paper addresses the design and implementation of PSO optimized fuzzy control for mobile robot path tracking. Firstly, fuzzy control is applied to track the desired trajectory. Secondly, this path tracking has been improved with the PSO optimized fuzzy controller. The proposed PSO fuzzy controller was investigated based on several conducted MATLAB simulation scenarios for a mobile robot. The simulation results show better performances with the proposed PSO optimized fuzzy controller when it is compared with the fuzzy controller without optimization.

Keywords: *fuzzy control, Industry 4.0, mobile robot navigation, Particle swarm optimization (PSO),path tracking*

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1. INTRODUCTION

In many static and dynamic environments in the scope of smart factories, mobile robots are increasingly being employed. Industry 4.0 goes beyond the typical idea of machine-to-machine communication, allowing mobile robots to transport of components and even completed products. Following a defined trajectory, the mobile robots navigate itself to avoid obstacles and move to a target point, with possibility to collaborate with the production systems like automation cells.
The different motion control techniques can be distinguished: (i) model-based methods and (ii) artificial methods based on fuzzy logic, neural networks, genetic algorithms or hybrid combination of these approaches[1].

THEORETICAL AND PRACTICAL ASPECTS OF INTERNET OF THINGS (IoT) TECHNOLOGY

TEORIJSKI I PRAKTIČNI ASPEKTI INTERNET OF THINGS (IoT) TEHNOLOGIJE

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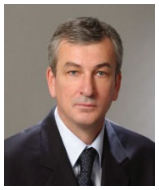
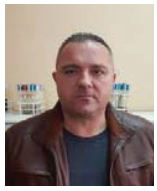

Savo Stupar *Mirha Bičo Ćar* *Emir Kurtović* *Grujica Vico*

ABSTRACT:
The good side of the Internet-the global computer network, is that it facilitates all forms of communication. With the development of the Internet, new types of communication are emerging: human communication with "smart things", which, together with human communication with a computer, represents Person to Maschine communication-P2M; communication between "smart things", which together with computer-to-computer communication and computer communication with "smart things," make up a new category of communication Maschine to Maschine (M2M). Internet of Things (IoT) or "Smart Things" are machines, robots, sensors, controls, etc. The aim of this paper is to explain in an understandable way the concept of IoT, its architecture, characteristics, technologies that enable the implementation of the IoT concept in practice, and the areas and security aspects of its application.

Keywords*: Internet of Things, RFID, NFC, Smart Things, Wi-Fi*

SAŽETAK:
Dobra strana Interneta-globalne mreže računara,je da olakšava sve vidove komunikacije. Razvojem Interneta, pojavljuju se nove vrste komunikacije: komunikacija čovjeka sa „pametnim stvarima“, koja zajedno sa komunikacijom čovjeka sa računarom predstavlja komunikaciju Person to Maschine - P2M; komunikacija između „pametnih stvari“, koja zajedno sa komunikacijom računara sa računarom i komunikacijom računara sa „pametnim stvarima“ čini novu kategoriju komunikacije Maschine to Maschine - M2M. Internet of things (IoT) ili Internet stvari ili „Pametne stvari“sumašine, roboti, senzori, upravljačkejediniceitd. Cilj ovog rada je našto razumljiviji način objasniti koncept IoT, njegovu arhitekturu, karakteristike, tehnologije koje omogućavaju realizaciju IoT koncepta u praksi, te područja i sigurnosne aspekte njegove primjene.

Ključne riječi: *Internet of Things, RFID, NFC, Pametne stvari, Wi-Fi*

TECHNOSOCIALITY AND THE RISE OF THE NETWORK SOCIETY

TEHNOSOCIJALNOST I USPON UMREŽENOG DRUŠTVA

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Halima Sofradžija

ABSTRACT:
The rapid transformation of the world influenced by innovative technologies is evidently creating an entirely new culture, technoculture, within which new values, new forms of interactivity and social substance are recognized and established, which eventually changes our reality irreversibly at all levels of human experience. Application of new technologies deeply transforms the social space. The rise of the network society and contemporary global processes invite us to contemplate on and better understand the complexity of the digital age. After all, today we talk about a historical transformation of the whole society, which has become firmly embraced by technology and innovative technologies, which, of course, consequently dramatically changes social practices and shapes an entirely new quality of life in the postmodern reality.

Keywords: *technoculture, techno-sociality, networked society, innovative technologie*

SAŽETAK:
Ubrzano preobražavanje svijeta koje nastaje pod utjecajem inovativnih tehnologija stvara evidentno jednu sasvim novu kulturu, tehnokulturu, unutar koje se prepoznaju i uspostavljaju nove vrijednosti, novi oblici interaktivnosti i društvene sadržajnosti, a što u konačnici nepovratno mijenja našu stvarnost na svim razinama iskustva. Primjena novih tehnologija duboko transformira društveni prostor. Uspon umreženog društva (Castells) i savremeni globalni procesi pozivaju nas promišljanju i boljem razumijevanju kompleksnosti digitalnog doba. Napokon, danas govorimo o povijesnoj transformaciji ukupnog društva koje je došlo u čvrsti zagrljaj tehnike i inovativnih tehnologija, što dakako posljedično izrazito mijenja društvene prakse i oblikuje jednan sasvim novi kvalitet života u postmodernoj stvarnosti.

Ključne riječi*: tehnokultura, tehnosocijalnost, umreženo društvo, inovativne tehnologije*

CYBER SECURITY ANALYSIS OF THE ELECTRIC POWER INFORMATION SYSTEM IN MONTENEGRO

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[1]Ministry of Public Administration Directorate of Electronic Governance and Information Security, Podgorica, Montenegro
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Aleksandar M. Anđić


Ramo Šendelj


Ivana Ognjanović

ABSTRACT:
In most countries, the electricity sector is designated as critical infrastructure. Therefore, nowadays, the field of cyber security is a crucial component in the functioning of all factors in the electricity sector of a country. A similar situation is observed in Montenegro, where the energy sector is designated as critical and highly ranked on the priority list for ensuring high-quality cyber security. Analyzing existing models at the global level, and taking into account the standards and recommendations provided by the relevant institutions, the authors of this paper have made an effort to illustrate the current state of cyber security of the electricity system in Montenegro, using the Feature model. Based on the established model, an analysis of the cybersecurity situation of this sector was done and some conclusions were drawn.

Keywords: *power system, cyber security, critical infrastructure, feature model, ES-C2M2*

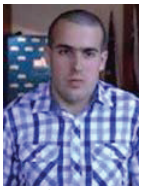
SAŽETAK:
U većini država svijeta, elektro-energetski sektor je označen kritičnom infrastrukturom. Samim tim, u današnje vrijeme oblast sajber bezbjednosti je neizostavna komponenta u funkcionisanju svih činilaca u elektro-energetskom sektoru jedne države. Slična situacija je i u Crnoj Gori, gdje je oblast energetike označena kritičnim sektorom i visoko kotirana na listi prioriteta za osiguranje kvalitetne sajber bezbjednosti. Kroz analizu postojećih modela na globalnom nivou, uzimajući u obzir standarde i preporuke koje pružaju relevantne institucije, autori ovog rada su se potrudili da na ilustrativan način predstave trenutno stanje sajber bezbjednosti elektro-energetskog sistema u Crnoj Gori, koristeći Feature model. Na osnovu uspostavljenog modela, izvršena je analiza stanja sajber bezbjednosti ovog sektora i izvedeni su određeni zaključci.

Keywords: *elektro-energetski sistem, sajber bezbjednost, kritična infrastruktura, feature model, ES-C2M2*

NATURE-INSPIRED CRYPTOANALYSIS METHODS FOR BREAKING VIGENÈRE CIPHER

METODE KRIPTOANALIZE ZA RAZBIJANJE VIGENERÈOVE ŠIFRE NADAHNUTE PRIRODOMÈ

Lucija Brezočnik, Iztok Fister Jr., Vili Podgorelec
Faculty of Electrical Engineeringand Computer Science, University of Maribor, Slovenia


Lucija Brezočnik Iztok Fister Jr. Vili Podgorelec

ABSTRACT:
The protection of sensitive data against unauthorized access remains a primary concern of modern life. Over time, many different approaches have been introduced to tackle this problem, from substitution ciphers in classic cryptography to post-quantum cryptography as a representative of modern cryptography. In this paper, we focus on a polyalphabetic substitution cipher, precisely the Vigenere cipher. For a cryptoanalysis of the latter, we utilized five nature-inspired algorithms, i.e., Differential Evolution, Firefly Algorithm, Particle Swarm Optimization, Artificial Bee Colony Algorithm, and Cuckoo Search, were utilized. Furthermore, different key lengths were analysed to investigate the search behaviour of the selected algorithms. The results of the experiment show that the applicability of the nature-inspired algorithms for cryptoanalysis is very promising. Out of the tested algorithms, the Differential Evolution outperformed other algorithms.

Keywords: *Cryptoanalysis, Nature-inspired Algorithms, Swarm Intelligence, Vigenère Cipher*

SAŽETAK:
Zaštita osjetljivih podataka od neovlaštenog pristupa i dalje ostaje glavna briga modernog života. S vremenom su uvedeni mnogi različiti pristupi za rješavanje ovog problema, od zamjenskih šifri u klasičnoj kriptografiji do post-kvantne kriptografije kao predstavnika moderne kriptografije. U ovom članku fokusiramo se napolialfabetsku zamjensku šifru, tačnije na šifru Vigenèrea. Za kriptoanalizuspomenutogkoristili smo pet algoritama inspirisanih prirodom, tj. Diferencijalnu evoluciju, Algoritam krijesnice, Optimizaciju rojeva čestica, Algoritam umjetnih pčelinjih kolonija i Pretraga kukavice. Nadalje, analizirane su različite dužine ključeva kako bi se istražilo ponašanje pretraživanja odabranih algoritama. Rezultati eksperimenta pokazuju da je primjena algoritama za kriptoanalizu nadahnutih prirodom vrlo obećavajuća. Među testiranim algoritmima, Diferencijalna evolucija nadmašila je druge algoritme.

Ključne riječi: *kriptoanaliza, prirodom nadahnuti algoritmi, inteligencija roja, Vigenèreova šifra*

USING A CHAOS GENERATOR TO ACHIEVE CRYPTOGRAPHIC STRENGTH PARAMETERS CLOSE TO ABSOLUTELY STABLE CIPHERS

Irina Fedosova[1], Tetiana Levytska[1], Vira Shendrik[2], Michail Vereskun[1], Sergii Shendryk[2]
[1]*Priazovsky State Technical University*
[2]*Sumy State University, Information Technologies of Design*





Irina Fedosova Tetiana Levytska Vira Shendrik Michail Vereskun Sergii Shendryk

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ABSTRACT:
It is possible now to implement algorithms that can be roughly comparable in reliability with absolutely stable cryptosystems. The Chua scheme is a dynamic chaos model has a complex behavior with general ease of implementation and is capable of operating over a wide range of values.So, it was chosen as a modeling object to use it to information security. This chaos generator gives a very high degree of unpredictability, close to truly random sequences. The result is practically not predictable regardless of the availability of information about the algorithm and parameters. The generated sequences of numbers, taking into account their unlimited length and uniqueness of combinations of values, are ideal from the point of view of their use as keys for data encryption by the cryptosystem. The scientific novelty of this study is the developed method of applying the mathematical model of the chaos generator "Chua scheme" as the main component of the hybrid cryptosystem.The chaos generator is used as a source of public and private keys of the asymmetric encryption algorithm and the key of the symmetric algorithm directly used for data encryption.

Keywords: *chaos generator, cryptosystem,Chua scheme,mathematical model, cryptography*

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1. INTRODUCTION

At the present time, when common and easily accessible technical devices are used to transfer and store any data, the protecting information issue of violation, its confidentiality, integrity, and accessibility is one of the most significant questions. Transmitted data can be affected by the transmission medium or external (relative to the information system) medium, as well as various actions of intruders are aimed to intercepting, damaging information, etc.
Modern cryptography is characterized by opened encryption algorithms which are using computational tools.

THE ARCHITECTURE OF FUZZY LOGIC AUTOMAT OF PARALLEL ACTION FOR THE INTELLIGENT SMART GRID NETWORKS

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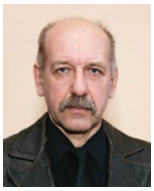

Stanislav Bovchaliuk Serhii Tymchuk Sergii Shendryk Vira Shendryk

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ABSTRACT:
Some technology introduction problems of Smart Grid in the electric networks of Ukraine are considered in the article. It is offered to apply the automats of parallel action in control system by a power supply. It is offered to make alteration in the structure of parallel action classical automat for the decision of problem vagueness detains. The general strategy is set for the construction of parallel action automats with fuzzy logic.

Keywords: *SMART GRID, PLD-controller, parallel action automat, technology of parallel logical management, fuzzy logic*

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1. INTRODUCTION

The modern state of electric networks in Ukraine needs modernization. In addition, the permanent increasing on the electric system takes place. It is conditioned by the consumers amount increasing and specific consumption of energy by consumers. An additional call for power engineering specialists is swift development of the so-called "green" energy - wind power-stations, sunny stations sources, etc [1, 2, 3]. Energy sources characteristics are:

- mainly small generating power;
- its instability (day's, weather, etc.);
- distribution of electric networks.

These features do not allow integrating such sources to the existent electric networks. They require introduction of considerable changes to organization and maintenance of Ukrainian power economy.
The power trend progress is clearly defined in energy well – developed countries.

GREEN TECHNOLOGY APPROACH TO COMB-BASED DECIMATORS DESIGN

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[2]University of Bihac, Bosnia and Herzegovina


G. Jovanovic Dolecek Isak Karabegovic

ABSTRACT:
This paper presents a simple method to design comb-based decimation filter. The goal is to get a low power design, while improving the comb alias rejection. The proposed structure has two stages. In the first stage is a comb filter in a nonrecursive form, and presented with its polyphase components. In the second stage is a comb filter cascaded with the modified combs. The cascade is also presented with the polyphase components. In that way the filters in the first stage are moved to the rate which is lesser than the high input rate, and which is determined by the decimation factor of the first stage. Similarly, the filters at second stage are moved to the rate which is M times time lesser than the high input rate, where M is a decimation factor. As a consequence, the proposed structure is a low power structure. The proposed method is compared with some methods from literature.

Keywords: *decimation, aliasing, decimation filter, low power, two-stage*

1. INTRODUCTION

Green communications “extends to all branches of communications with the goal of minimizing resource use whenever possible and of selecting energy-efficient communications and technologies”, [1, 2].

In this paper we consider comb-based decimation filter design with the goal to get a power efficient structure and an improved alias rejecting.

Decimation finds applications in communications, in oversampled Sigma-Delta A/D (Analog/Digital) converters, sampling rate conversion, among others, [3].

Decimation introduces aliasing which must be eliminated by filter, called decimation filter. The most simple decimation filter is a comb filter which does not require multipliers. This filter naturally provides aliasing rejection in the bands around the comb zeros, called folding bands. However, the aliasing rejection of comb filter is very limited, and must be improved.

The most effective way is obtained by introducing additional zeros into comb folding bands, and thus increase widths and attenuations in those folding bands.

DETERMINATION OF THE SAMPLING INTERVAL OF TIME SERIES OF MEASUREMENTS FOR AUTOMATION SYSTEMS

Serhii Tymchuk[1], Ivan Abramenko[1], Katerina Zahumenna[1], Serhii Shendryk[2], Vira Shendryk[2]
[1]Kharkiv Petro Vasylenko National Technical University of Agriculture, Kharkiv, Ukraine
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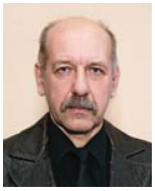



Serhii Tymchuk Ivan Abramenko Katerina Zahumenna Serhii Shendryk Vira Shendryk

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ABSTRACT:
The technique for the sampling interval of time series determining of parameter measurements for automation systems are improved. Mathematical apparatus of Discrete Fourier Transform is used to describe the frequency characteristics of signals in measuring channels of automation systems and Kotelnikov theorem. It is performed computer simulation of the proposed method of decision-making based on comparison of harmonic amplitudes of the maximum frequency of spectrum in different components of the measuring signal.

Keywords: *measuring channel, sampling interval, digital filtration, Kotelnikov theorem, Discrete Fourier Transform, modeling*

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1. INTRODUCTION

Measurement of technological parameters is implemented by measuring channels, which are structurally or functionally separate part of information system. Information system performs a sequence of operations from perception of measured value to obtaining of result of its measurements, which is displayed by a number or a corresponding code [1,2,3].

Components of the measuring part make a certain error $\varepsilon(t)$ in a signal $y(t)$.

Most signals in automation systems are analog in nature. It is impossible to enter such signal into a computer and process it, because at any time interval it has an infinite set of values. Therefore, in digital processing systems, a signal is represented in discrete digital form.

The digital signal is derived from the analog signal by time sampling, level quantization, and encoding.

FUZZY MODEL OF QUALITY CONTROL OF THE FINISHED SOFTWARE PRODUCT

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Priazovsky State Technical University


Olha Pronina Piatykop Olena

ABSTRACT:
When developing a software product, the testing phase is the most important. Testing takes the most significant time of the entire development, so the automation of the testing process is an urgent task. Within the scope of the application, one can imagine the testing phase as a set of input linguistic variables, namely functional suitability, accuracy, interoperability, compliance, security, where the degree of confidence in the quality of the software product depends on the assessment of each variable. In this paper, you consider a model for checking the quality of a software product after its development. A fuzzy model is developed that was used to model the iterative life cycle of a software product. This approach is universal and can be applied to models of another category, for example, cascading due to a softer repetition of the testing stage. This knowledge and model can be applied in the field of automation of the testing process. This approach will significantly increase the speed of passage of this stage, reduce the influence of the human factor, minimize the possible error and optimize the development process.

Keywords: *fuzzy model, linguistic variable, software product quality, software product testing*

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1. INTRODUCTION

In today's world the process of writing software is constantly improving products. Number of developed software products is constantly growing; his writing is relatively less time testing. Because testing is one of the major and important steps to develop transmission in productive operation.

The testing process makes it possible to find out the correspondence between the given task and its realized form, as well as reduce the number of defects and improve the quality of the software.

Testing is divided into a large number of species from different directions, for example, for program purposes, system analysis, formality and more. And, in the context of software development, the full range of types is used, the main, by prevalence, is purpose testing, which includes functional testing (suitability, accuracy, interaction, etc.) and non-functional (convenience, failure and recovery, configuration, etc).

PARALLEL PROCESSING OF HTTP REQUESTS IN E-COMMERCE: A MODELING FRAMEWORK

PARALELNA OBRADA HTTP ZAHTJEVA U E-TRGOVINI: OKVIR ZA MODELIRANJE

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I. Hristoski D. Koltovska Nechoska T. Dimovski

ABSTRACT:
Within the paper, we propose a modeling framework for performance evaluation of generic e-Commerce systems based on the utilization of Client/Server Interaction Diagrams (CSIDs) and the class of Non-Markovian Stochastic Petri Nets (NMSPNs). As an example, we represent the CSID for the SEARCH function using a NMSPN, thus providing a performance model suitable for estimating the speedup gains of e-Commerce systems that utilize multicore CPUs and parallel processing of HTTP requests.

Keywords: *Parallel Processing, e-Commerce, Non-Markovian Stochastic Petri Nets (NMSPNs), Client/Server Interaction Diagrams (CSIDs), Modeling and Simulation*

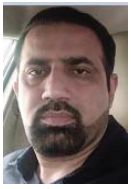
SAŽETAK:
U ovom radu predlažemo okvir za izgradnju modela za ocjenjivanje performansi generičkih sustava e-trgovinekoji se temelji na korištenju dijagrama interakcije između klijenta i servera (Client-Server Interaction Diagrams, CSIDs) i klase Ne-Markovljevih Stohastičkih Petri Mreža (Non-Markovian Stochastic Petri Nets, NMSPNs). Kao primjer, predstavljamo CSID dijagram za SEARCH funkciju koristeći NMSPN mrežu, pružajući tako model performansi pogodan za procjenu ubrzanja sustava e-trgovine koji koristi višejezgreneprocesore i paralelnu obradu HTTP zahtjeva.

Ključne riječi: *paralelnaobrada, e-trgovina, Ne-Markovljeve Stohastičke Petri Mreže (NMSPN), dijagram interakcije između klijenta i servera (CSID), modeliranje i simulacija*

A DYNAMIC CALL ADMISSION CONTROL SCHEME AND PERFORMANCE MODELING FOR 4G LTE NETWORKS

DINAMICKA KONTROLA PRISTUPA RADIO RESURSIM KAO I MODELIRANJE PERFORMANSI 4G LTE SISTEMA

Faisal Hayat[1], Zlatan Jukic[2], Iqra Abdul Gaffar[3]
[1]Department of Computer Engineering UET Lahore, Pakistan
[2]Faculty of Technical HTL Rankweil&TUWien, Austria
[3]Department of Computer Engineering UET Lahore, Pakistan



Faisal Hayat Zlatan Jukic Iqra Abdul Gaffar

ABSTRACT:
In long term evolution (LTE) also called 4G networks, the number of service classes have been increased and call admission control (CAC) strategies are implemented to fulfill the QoS requirements. Very efficient and dynamic call admission control (CAC) strategies are still required to guarantee quality of service while achieving better utilization of network resources.CAC schemes based on bandwidth reservation, bandwidth degradation and preemption have been proposed with the aim of better utilization of network resources.Markov chains have been used to evaluate the proposed CAC scheme along with necessary simulations for validation.

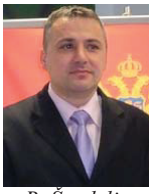
Keywords:*Call admission control (CAC), Call blocking probability (CBP), Call dropping probability (CDP),, Quality of service (QOS), Long term evolution (LTE).*

SAŽETAK:
U dugorocnoj evoluciji (LTE) koja se naziva i 4G mreza, broj klasa usluga je znatno povecan i implementirane su strategije za kontrolu prijema poziva i pristupa radio resursima (CAC) kako bi se ispunili zahtjevi QoS-a.(CAC) strategije kontrole upravljanja poziva i CAC algoritmibazirani na optimalnom rezerviranjui reduciranju propusne širine kao i rasterecenju mreznih radio resursa. Markovljevi lanci korišteni su za procjenu predložene CAC sheme zajedno sa simulacijama potrebnim za validaciju rezulata.

Ključne riječi: *Kontrola pristupa poziva (CAC), vjerovatnoca blokade poziva (CBP), vjerovatnoca neuspjesne veze (CDP), kvalitet usluge (QOS), mobilni telefonski sistem (LTE)*

AI ENHANCED SERVICES IN PERSON-CENTRED CARE IN NEUROLOGY

Ivana Ognjanović[1], Ramo Šendelj[1]
[1]University of Donja Gorica,, Montenegro

I. Ognjanović *R. Šendelj*

ABSTRACT:
The Person-centred care (PCC) is an innovative approach that sees patients as equal partners in the planning, development and delivery of care, and active participants in the management of their health and wellbeing. Preliminary research over PCC applications showed advances in concordance between care provider and patient on treatment plans, improved health outcomes and increased patient satisfaction. On the other side, AI has promising potentials to support and enhance PCC services and improve their functioning. This paper presented results of preliminary research aimed on identification of AI enhanced services applied in PCC settings within neurology department, with special focus on stroke patients and their rehabilitation process.

Keywords: *artificial intelligence, person-centred care, neurology*

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1. INTRODUCTION

The person-centred care (PCC) as innovative approach in health care has been shown to advance concordance between care provider and patient on treatment plans, improve health outcomes and increase patient satisfaction [1]. The core concept behind PCC is putting the ‘*person before the disease- see the person with the disease not just the disease*’ thus ensuring patients and professionals acting as partners in the care process. Yet, despite these and other documented benefits, there are a variety of significant challenges to putting PCC into clinical practice, naming just a few: (i) *patient narratives*- person’s views about his/her life situation and condition, his/her feelings, beliefs and preferences, all linked with biological markers or images, as well as with cultural, educational and behavioural settings; (ii) *shared decision making*- creation of extensive illness management between professionals and patients (often including relatives); (iii) *consistent evaluation framework*- evaluate the outcome and assess the benefits for all (patients, professionals, health care system).
The innovative PCC approach is directly linked to existing healthcare system (it’s efficiency, cost and quality of care indicators, data integration, etc.) and concrete health issues.

APPLICATIONS EDALJINAR AND MDALJINAR

APLIKACIJE EDALJINAR I MDALJINAR

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Sarajevo, Bosnia and Herzegovina

Suad Sućeska

ABSTRACT:
Applications eDaljinar and mDaljinar are made on the basis of the document 'DALJINAR with routes and minimum travel times for bus stations and stops in BiH'. Purpose of these applications is to enable work with distance and duration data between stations of passenger transport routes. These data include routes, stations, roads, entities, distances from previous station, distances from start station, drive duration from previous station, drive duration from start station, roads intersections. Web application eDaljinar is made in PHP, and mobile application mDaljinar is made for mobile operating system Android minimal version 21.

Keywords: *travel distances, Web application, mobile application, mobile user, Android.*

SAŽETAK:
Aplikacije eDaljinar i mDaljinar su napravljene na osnovu dokumenta 'DALJINAR sa relacijama i minimalnim vremenima vožnje za autobusne stanice i stajališta u BiH'. Cilj ovih aplikacija je da omoguće rad sa podacima o udaljenostima i trajanjima vožnje između stanica relacija putničkog transporta.Ovi podaci uključuju: relacije, stanice, puteve, entitete, udaljenosti od prethodne stanice, udaljenosti od polazne stanice, trajanja vožnje od prethodne stanice, trajanja vožnje od polazne stanice, ukrštanja sa putevima. Web aplikacija eDaljinar je izrađena u PHP-u, a mobilna aplikacija mDaljinar je napisana za mobilni operativni sistem Android minimalne verzije21.

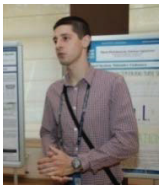
Ključne riječi: *daljinar, Web aplikacija, mobilna aplikacija, mobilni korisnik, Android.*

CYBERSECURITY OF AUTONOMOUS AND CONNECTED VEHICLES

INFORMACIJSKA SIGURNOST AUTONOMNIH I POVEZANIH VOZILA

Pero Škorput**, **Sadko Mandžuka**, **Saša Bermanec**, **Hrvoje Vojvodić
Faculty of Traffic and Transport Sciences, Zagreb, Croatia



Pero Škorput Sadko Mandžuka Saša Bermanec Hrvoje Vojvodić

ABSTRACT:
This paper describes the cybersecurity problem area of intelligent transport systems (ITS),and especially regarding autonomous and connected vehicles. The main vulnerabilities of the ITS system are analyzed in the paper. Real cases and examples of attacks and hacking of autonomous vehicle systems are described. Also, the paper describes the goals and priorities of the transport system for protection against cyber-attacks.

***Keywords:** intelligent transport systems, autonomous and connected vehicles, cybersecurity, transport system security*

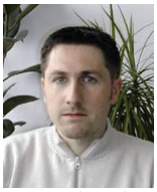
SAŽETAK:
U ovom radu opisna je informacijska sigurnost inteligentnih transportnih sustava u području autonomnih i povezanih vozila. U radu su analizirane glavne ranjivosti ITS sustava. Opisani su primjeri napada i hakiranja autonomnih vozila. Također, u radu su opisani ciljevi i prioriteti zaštite prometnog sustava od cyber napada.

***Ključne riječi:** intelligent transport systems, autonomna i povezana vozila, cybersigurnost, sigurnost prometnog sustava*

INVESTIGATION OF VEHICLE DRIVING CYCLES IN URBAN TRAFFIC CONDITION

ISTRAŽIVANJE CIKLUSA VOŽNJE MOTORNIH VOZILA U GRADSKIM USLOVIMA SAOBRAĆAJA

Mirsad Trobradović, Boran Pikula, Almir Blažević, Dževad Bibić
University of Sarajevo, Sarajevo, Bosnia and Herzegovina




Mirsad Trobradović BoranPikula AlmirBlažević Dževad Bibić

ABSTRACT:
Traffic jams and resulting air pollution have become severe problem in world urban areas long time ago. Fast growing number of vehicle in recent years, and inadequate development of traffic infrastructure, made these problems even worse in cities of Bosnia and Herzegovina. To start solving these problems, it will be useful to know real traffic conditions in particular urban area. One of the important information is vehicle driving cycles in real traffic conditions which can enable to determinate typical driving pattern for particular area. Measurements were conducted in main city roads in Sarajevo during different periods of working and non-working day. Results and analysis of driving cycles are presented in the paper.

Keywords: *vehicle, driving cycle, urban traffic conditions*

SAŽETAK:
Saobraćajne gužve i zagađenje zraka koje one stvaraju odavno su postali ozbiljan problem u urbanim sredinama diljem svijeta. Nagli porast broja vozila,uz neadekvatni razvoj saobraćajne infrastrukture,posljednjih su godina u Bosni i Hercegovini ovaj problem učinili još većim. Da bi se počeli rješavati navedeni problemi korisno je i vrlo bitno poznavati stvarne uslove saobraćaja u određenom urbanom području. Jedna od važnih informacija je poznavanje ciklusa vožnje u stvarnim uslovima saobraćaja, na osnovu kojih se mogu odrediti tipični obrasci kretanja vozila za određeno područje. U tom cilju su provedena mjerenja parametara kretanja vozila na glavnim gradskim saobraćajnicama u Sarajevu, tokom različitih perioda radnog i neradnog dana. Rezultati mjerenja i kratka analiza ciklusa su prikazani u ovom radu.

Ključne riječi: *vozilo, ciklus vožnje, gradski uslovi saobraćaja*

IMPROVEMENT OF VARIABLE SPEED LIMIT CONTROL EFFECTIVENESS IN CONTEXT OF CONNECTED VEHICLES

POVEĆANJE EFIKASNOSTI PROMJENJIVOG OGRANIČENJA BRZINEU KONTEKSTU UMREŽENIH VOZILA

Martin Gregurić, Sadko Mandžuka, Miroslav Vujić
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Martin Gregurić Sadko Mandžuka Miroslav Vujić

ABSTRACT:
The problem with Variable Speed Limit Control (VSLC), as one of powerful ITS services, is that a certain percentage of drivers do not obey posted speed limits. Mentioned behavior induces a reduction of the VSLC service effectiveness. In order to deal with this problem, the concept of Intelligent Speed Adaptation (ISA) is introduced. ISA can directly reduce the vehicle's speed according to the information obtained from the traffic control system installed on road infrastructure. Computed optimal speed limits are transmitted to the vehicles with ISA communication capabilities. Today, the connected vehicles concept is the core approach for implementation ISA system. The focus of this paper is to provide an analysis regarding the impact of the ISA on the effectiveness of VSLC in the context of connected driving.

Keywords: *Variable speed limit control, Connected vehicles, Intelligent speed adaptation*

SAŽETAK:
Efektivnost promjenjivog ograničenja brzine (engl. VariableSpeed Limit Control - VSLC), kao jedne od najistaknutijih ITS usluga, je umanjena zbog većeg postotka vozača koji ne poštuje ograničenja brzine. Koncept Inteligentne prilagodbe brzine (engl. IntelligentSpeedAdaptation - ISA) omogućuje direktno smanjenje brzine vozila na temelju informacija koje sedobivajuod prometno-upravljačkih jedinica koje su instalirane na prometnoj infrastrukturi. Izračunata optimalna ograničenja brzina se odašilju vozilima sa ISA komunikacijskim uređajem. Koncept umreženih vozila je danas okosnica implementacije ISA sustava. Fokus ovoga rada je pružanje analize koja se odnosi na utjecaj ISA sustava na efektivnosti VSLC-a u kontekstu umreženih vozila.

Ključne riječi: *Promjenjivo ograničenje brzine, Umrežena vozila, Inteligentnaprilagodba brzine*

AUTONOMOUS VEHICLES IN URBAN TRAFFIC

AUTONOMNA VOZILA U GRADSKOM PROMETU

Miroslav Vujic, Sadko Mandzuka, Luka Dedic
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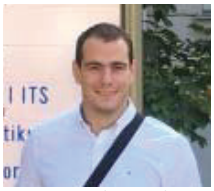
Miroslav Vujic


Sadko Mandzuka



Luka Dedic

ABSTRACT:
This paper describes the implication of autonomous vehicles on urban transport system. Levels of vehicles autonomy and basic technologies as well as some impacts of autonomous vehicles on urban transport is presented. Also, there are some consequences of autonomous and connected vehicles on road infrastructure. Some implication of deployment of autonomous and connected vehicles for transport system of Republic of Croatia are highlighted.

Keywords: *autonomous vehicles, connected vehicles, public transport, road infrastructure*

SAŽETAK:
Ovaj rad opisuje utjecaj autonomnih vozila na sustav gradskog prijevoza. Predstavljene su razine autonomije vozila i osnovne tehnologije, kao i neki učinci autonomnih vozila na gradski prijevoz. Također, postoje neki učinci autonomnih i povezanih vozila na cestovnu infrastrukturu. Ističu se neke od implikacija korištenja autonomnih i povezanih vozila na prometni sustav Republike Hrvatske.

Ključne riječi: *autonomna vozila, povezana vozila, javni gradski prijevoz, cestovna infrastruktura*

ANALYSIS OF DRIVERS VISUAL ABILITIES FOR DETECTING PEDESTRIANS IN CORRELATION WITH THE RISK OF TRAFFIC ACCIDENTS

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Osman Lindov Adnan Omerhodžić

ABSTRACT:
Risk in traffic or traffic environment is constant, always present and can never be completely eliminated. In urban areas, the highest percentage of risky traffic situations is related to pedestrians and their specificities in traffic participation. Pedestrians as vulnerable road users participate in different functions, ie behaviors and modes of movement. Due to the flexibility and the ability to change speeds and movements relatively easily, pedestrians often cause incident and risky traffic situations. The timely detection of pedestrians by motor vehicle drivers is one of the key parameters that directly affects the available response capabilities of motor vehicle drivers to take safety actions in order to avoid pedestrian conflict. This paper presents the basics of the concept and capabilities of new technologies for monitoring and exploring drivers 'views in order to generalize conclusions to improve the effectiveness of drivers' response in the prevention of traffic risks. Custom hardware and software components will be used to monitor the driver's view for research and analysis purposes.

Keywords: *Tracking views, risk in traffic, drivers response, traffic safety*

1. INTRODUCTION

The study of eye movement monitoring has a relatively long history, which is evident from the numerous scientific and professional literature in this field, as well as a large number of developed systems and devices. The original devices and instruments that emerged at the end of the 19th century provided objective results but were uncomfortable for examiners. At the beginning of the 20th century, systems and methods were developed based on photography, and by the end of the 20th and the beginning of the 21st century, with the development of computer technologies, significant advances were made in the improvement of devices with the ability to use and analyze real-time data. Eye movement tracking systems are nowadays used in various fields: market research, marketing, web space usage research, immobile view control, psychology and vision research, medical research, entertainment and video games [1].

PREDICTIVE MODEL OF PERSONALIZATION OF SERVICES OF AUTOMATED MOBILITY BASED ON THE RECORDS OF USER MOVEMENT IN MOBILE NETWORKS

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Mirza Berković


Amel Kosovac

ABSTRACT:
The aim of this paper is to investigate and develop a predictive model of personalization of automated mobility services based on historical and realtime data on the trajectory of movement of users in mobile networks. The problem is based on the fact that the concept of automated mobility enables a variant of modeling the parameters of the vehicle trajectory and personalization of the service according to the wishes and needs of users, whereby optimization and personalization can be performed both on the user side and on the side of the mobility service provider. The paper uses a research approach within the domain of intelligent transport systems based on the extraction of telecommunication activity data into the index of personalization of mobility parameters using the methodology of predictive analytics and neural inference based on neural network. The research findings establish and show a clear correlation of historical and realtime spatial data of the movement of users and their activities in the mobile network with indicators of quality of urban and sustainable mobility….

Keywords: *predictive model, mobility personalization, automated mobility*

SAŽETAK*:*
Cilj rada je da se istraži i izradi prediktivni model personalizacije usluga automatizirane mobilnosti temeljen na historijskim i realtime podacima o trajektoriji kretanja korisnika u mobilnim mrežama. Problematika rada polazi od činjenice da koncept automatizirane mobilnosti omogućava varijantu modeliranja parametara putanje vozila i personalizaciju usluge prema željama i potrebama korisnika, pri ćemu se optimizacija i personalizacija može izvršiti kako na strani korisnika tako i na strani ponuđača usluga mobilnosti. U radu je korišten pristup istraživanja u okviru domene inteligentnih transportnih sistema temeljem ekstrahiranja podataka o telekomunikacijskim aktivnostima u indeks personalizacije parametara mobilnosti korištenjem metodologije prediktivne analitike i neizrazitog zaključivanja zasnovanog na neuronskoj mreži. Nalazi istraživanja uspostavljaju i pokazuju jasnu korelaciju historijskih i realtime prostornih podataka kretanja korisnika i njegovih aktivnosti u mobilnoj mreži sa indikatorima kvalitete urbane i održive mobilnosti. ….

Ključne riječi*: prediktivni model, personalizacija mobilnosti, automatizirana mobilnost*

LOGISTICS OPTIMIZATION OF AGRICULTURAL PRODUCTS SUPPLY TO THE EUROPEAN UNION BASED ON MODELING BY PETRI NETS

Olexiy Pavlenko[1], Natalya Shramenko[2,3], Dmitriy Muzylyov[2]
[1]Kharkiv National Automobile and Highway University
[2]Kharkiv Petro Vasylenko National Technical University of Agriculture
[3]Ukrainian State University of Railway Transport



O. Pavlenko N. Shramenko D. Muzylyov

ABSTRACT:
The using of digital logistics, based on intensive developments of smart technologies, into the system of product supply allows achieving optimal conditions for a certain period with the expected efficiency level. At the same time, it is necessary to consider increasing demand trend for these services in the sphere of agro-products supply from Ukraine to European Union markets. The use of "smart systems," Internet of Things "(IoT), big data allows to quickly obtain info from hardware and other drives: technical tools installed on trucks, containers, ships, for operational monitoring and control of technological processes, as well as for making accurate forecasts. The presented supply system is distributive and parallel working with asynchronous interactions. Therefore, it is proposed to use the type of Petri nets - CPN tools to study systems behavior in enough depth and to obtain information about their most important characteristics. Models developed based on Petri nets have shown that in addition to clarity and simplicity in application, they allow considering various probabilistic factors. This fact allows us to simulate, analyze and predict works for all system participants according to promptly calculated values for each specific management object.

Keywords: *robot, stock, Europe, smart, models, Petri Nets, management, agricultural products, Internet of Things*

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1. INTRODUCTION

Cargo transportations are now seen as a complex system influenced by globalization effects, the integration of different transport kinds, geographically distributed operations and expanded business models [1].This complexity is also compounded by the need to respond in real-time to unexpected situations detected during the transportation phase (e.g. weather conditions, strikes, accidents).Thus, critical problems are timely delivery of cargo, transportation efficiency to meet requests of a very demanding market.The ability to detect and remove all possible obstacles and risks in real-time becomes the main competence for logistics companies [2, 3].

DIRECTIONS FOR QUALITY ASSURANCE OF SPECIALISTS TRAINING IN LOGISTICS AND TRANSPORT SPHERES FROM A COMPETENCE APPROACH PERSPECTIVE

Natalya Shramenko[1,2], Dmitriy Muzylyov[1], Vladyslav Shramenko[3,1], Pavlo Mazyliuk[4]
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[2]Ukrainian State University of Railway Transport
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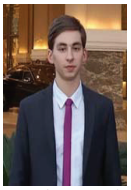
N. Shramenko

D. Muzylyov

V. Shramenko

P. Mazyliuk

ABSTRACT:
An experience analysis of educational systems in many countries shows that one way to update education content and educational technologies is to apply a professional approach that only complements the list of educational innovations without reducing classical approaches importance. The analysis of recent studies has been carried out. It helps to determine that a competency approach implies the need to strengthen practical orientations of education. The prerequisites for the realization of a competence approach in education are defined, due to the European integration of Ukrainian higher school, with features of modern society live and increasing requirements by employers. Professional activity features for specialists in logistics and transport spheres at modern conditions are described. These specific skills are consisting in intense intellectual activity, ability to make decisions independently and quickly, to use information and communication technologies for optimization of technological processes in transport. The directions of education to ensure the quality of training and increase the competence of specialists in the field of logistics and transport are proposed. They based on the close interaction of theory and practice, which contribute to the graduate 's acquisition of the potential of competitiveness in constantly changing conditions, aimed at developing the abilities of students to solve professional problems and problems with the application of knowledge, skills, and professional experience.

Keywords: *education, competent approach, competence, quality training of specialists, skills*

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1. INTRODUCTION

The vocational training process of specialists in technical spheres, including in the specialty "Transport technologies," is characterized by the integration process into European systems.An analysis of experiences about educational systems shows in many countries that one way to update education contents and educational technologies is to adopt a competency approach that only complements the list of educational innovations without reducing classical approaches …

MATHEMATICAL MODEL OF REVERSE LOADING ADVISABILITY FOR TRUCKS CONSIDERING IDLE TIMES

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[2]Ukrainian State University of Railway Transport


D. Muzylyov N. Shramenko

ABSTRACT:
The article is aimed at determining the expediency of rational option choosing by reverse transportation loading during goods delivery in intercity directions. Five possible alternatives are proposed to truck returns while waiting for backloading at first step of researches. An integrated criterion is selected as a condition for rational option choosing of truck returns.It is a synergistic effect for carriers and customers of transport services. Therefore, rational option search to return vehicles with reverse loading is to choose the best values: maximum cost-effectiveness of transportation and minimum delivery period.The result is a compromise solution between carrier and customer interests. Such an approach will allow transport companies to expand their influence sphere and find new permanent clients.

Keywords: *cargo, supply, trucks, logistics, supply chain, idle time, reverse loading, backloading transportation, criterion, synergetic*

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1. INTRODUCTION

The use of a synergistic approach to supply chain management will allow most transport process indicators integration, which will significantly improve transportation conditions.
A synergistic effect is called such an approach in logistics, which is achieved by a mutual strengthening of ties of one logistics system with others according to the portal "Trade Master Group" [1].Oneoption for a synergistic approach is to ensure the timely reverse loading of trucks. This is especially true in long-distance transport.
The procedure of transit cargo loading is used when it is necessary to minimize expenses for vehicle idle mileage at reverse direction routes. This is main essence of backloading transportation strategy. At the same time in reverse directions, it can deviate vehicle rides from route trajectory, which was in forward directions. Backloading transportation allows increasing levels using mileage and trucks cargo capacity on routes.Information on available applications for transportation can be found on the Internet through specialized logistics sites.

MODEL FOR CHOOSING RATIONAL TECHNOLOGY OF CONTAINERS TRANSSHIPMENT IN MULTIMODAL CARGO DELIVERY SYSTEMS

Natalya Shramenko[1,2], Dmitriy Muzylyov[1], Vladyslav Shramenko[3,1]
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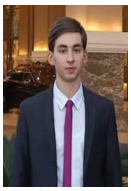
[3]V. N. Karazin Kharkiv National University





N. Shramenko *D. Muzylyov* *V. Shramenko*

ABSTRACT:
The study's purpose is to increase grain cargo delivery efficiency in containers in multimodal railway and water transportation by choosing a rational technology for container transshipment at port terminals. Typical technologies for port terminals are container cargoes transshipment from railway carriages to ship according to the direct option technology, as well as container cargoes transshipment through warehouses. The analysis of container transportations volumes dynamics was carried out in Ukraine, including grain supply. Most relevant is the daily total cost of container cargo transshipment at port terminals as efficiency criteria. Numerical experiments were conducted for various container quantities incoming to port terminals. As a result, total costs are dependent on container quantities incoming to port for alternative transshipment technologies. The obtained graphs allow determining rational technologies of container cargoes transshipment at port terminals depending on their quantity incoming to port in railway carriages.

Keywords: *terminal, container, direct option, technology, logistics, scheme, cargo, sea port, costs transshipment, railway carriage, ship, wagon, warehouse, supply.*

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1. INTRODUCTION

World experience shows that one of the effective ways to develop transport systems that ensure goods delivery in accordance with basics requirements of consumers for transport services are wide applications of multimodal transport technologies [1] and logistics principles [2] in transport process organization. Multimodal systems [3] and intermodal cargo delivery technologies are particularly relevant [4, 5].
The recent emphasis on organization [6] and efficient operations of cargo delivery systems [7] is due to reductions in trade cycle length, increases in storage costs [8] and necessities to accelerate responses to consumer demand [9].

A REVIEW OF ENABLING TECHNOLOGIES AND SOLUTIONS FOR IoT BASED SMART WAREHOUSE MONITORING SYSTEM

PREGLED TEHNOLOGIJA I RJEŠENJA ZA IoT BAZIRANI SISTEM ZA MONITORING SKLADIŠTA

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University of Sarajevo, Faculty of Traffic and Communications, Sarajevo, Bosnia and Herzegovina


Alem Čolaković


Samir Čaušević


Amel Kosovac


Ermin Muharemović

ABSTRACT:
Warehouses are premises used to store goods or products with the key task of ensuring its security as well as maintaining its value and quality. Some unexpected events in the warehouse such as temperature fluctuations and humidity changes, and other unwanted events may destroy the value of goods and products.In such circumstances, continuous monitoring of the warehouse and condition control should be carried out. This paper put in light some possibilities of developing cost-effective applications for the Warehouse Management Systems (WMS) which are based on the Internet of Things (IoT). We present a model of IoT system that helps to overcome some shortcomings in existing solutions for warehouse monitoring control.

Keywords: *Internet of Things (IoT), Warehouse Management System (WMS), monitoring system, smart logistics, application model*

SAŽETAK:
Skladišta su prostori koji se koriste za smještanje robe ili proizvoda sa zadatkom da omoguće njihovu sigurnost uz očuvanje vrijednosti i kvaliteta. Neočekivani događaji u skladištu, kao što su fluktuacije temperature, promjene vlažnosti zraka i drugi neželjeni događaji, mogu umanjiti ili uništiti vrijednost robe i proizvoda koji se skladište. U takvim okolnostima, gdje se skladište proizvodi i robe koji su osjetljivi na određene događaje i veličine, potrebno je provoditi kontinuirani monitoring i kontrolu. Ovaj rad prezentuje neke mogućnosti primjene IoT (Internet of Things) tehnologija za razvoj ekonomičnog sistema za monitoring i kontrolu skladišta(WMS). U radu je predložen model IoT sistema koji pomaže u prevazilaženju nekih nedostataka postojećih rješenja.

Ključne riječi: *Internet stvari (IoT), sistem za upravljanjeskladištima (WMS), monitoring sistem, pametnalogistika, model aplikacije*

THEORETICAL ASPECTS OF DIAGNOSING OF CAR ENGINE AT THE TIME OF ACCELERATION

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Lutsk National Technical University




Oleg Sitovskyi *Valerij Dembitskyj* *Yurii Bulik* *Pavlo Mazyliuk*

ABSTRACT:
During the operation of the car, a question often arises of the diagnosis of the technical state of their engines. Due to the fact that specialized stands are quite expensive, not all businesses have the ability to use them. Therefore, there is a problem diagnosing the technical condition of engines by other methods. In this article the method of diagnosing the technical condition of engines in terms of time of acceleration of the car. The proposed method is simple and relatively cheap, since it involves diagnosing engines. of the car's. To assess the suitability of the methodology and conducted experiments conducted evaluation of measurement uncertainty. The obtained results quite accurately characterize the state of the internal combustion engine, the maximum deviation is 8.7%. The given methodology will be useful for operating enterprises, for diagnosing motors of the cars.

Keywords: *car, diagnostics, engine, power, acceleration time, speed, torque.*

1. INTRODUCTION

The engine is one of the main units of the car. The efficiency of the entire vehicle depends on the technical condition of the engine. Today in Ukraine is quite acute a problem of effective and affordable diagnostics of technical condition of the engine separately and the transmission of the car in general. Modern cars are equipped with electronic control systems. They are quite sensitive to changes of the technical condition of the car. However, the result of natural wear of engine is increased fuel consumption, worsening traction and speed properties, reduced speed, increased emission levels. These factors certainly lead to increased operating costs, reduce the efficiency of transportation of passengers, cargo, and have a negative impact on the environment [1]. The consequence of this is the transition to alternative transportation technologies [2, 3] and a decrease in the synergistic effect of the functioning of transport systems [4].

At this stage of the development of science and technology offered quite a lot of different methods of diagnosing internal combustion engines according to the parameters of the crankcase oil, the amount of compression; the leakage of compressed air; power traction and dynamic stands; noise and vibration; for fuel consumption. A special case is the diagnosing of the engine on the signals of the electronic control unit using motor-scanners, motor testers and other similar equipment.

EFFECT OF REAR SPOILER SHAPE ON CAR AERODYNAMICS AND STABILITY

EFEKAT OBLIKA ZADNJEG SPOJLERA NA AERODINAMIČNOST I STABILNOSTAUTOMOBILA

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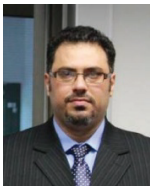
[1]University of Kragujevac, Faculty of Engineering, Kragujevac, Serbia
[2]University of Baghdad, College of Engineering, Baghdad, Iraq
[3]Hamburg University of Technology, Hamburg, Germany
[4]Technical College of Applied Studies in Kragujevac, Kragujevac, Serbia


Nadica Stojanović


Danijela Miloradović


Oday I. Abdullah


Ivan Grujić


Saša Vasiljević

ABSTRACT:
Computational dynamics is widely used when designing cars in order to obtain the optimum design and reduce the time and costs. Car design plays the main key in decision on purchasing the car. Car manufacturers have a very difficult task which is build a car that will be attracted potential buyers with its design, which does not deteriorate the car's aerodynamics or has the stability at high level of speeds. In order to enhance the car's stability, it's necessary to add the rear spoilers to the car body. This paper presents deep study for effects of fitting different types of rear spoilers on the car's aerodynamics and stability. Determination of corresponding aerodynamic drag and lift coefficients was performed using ANSYS software 14.5/ Fluid Flow CFX module....
Keywords: *rear spoiler, car aerodynamics, drag coefficient, lift coefficient, car stability*

REZIME:
Računski dinamika je širokoprimenjiva pri dizajnu automobila u cilju dobijanja optimalnog dizajna i smanjenju vremenu i troškova proizvodnje. Dizajn automobila igra ključnu ulogu pri odlučivanju o kupovini automobila. Proizvođači automobila imaju veoma težak zadatak, a to da naprave auto koji će svojim dizajnom privući potencijalne kupce, a koji neće narušiti aerodinamičnost ili stabilnost automobila pri kretanju na većim brzinama. Kako bi se povećala stabilnost automobila potrebno je dodati zadnje spojlere na karoseriju vozila. Ovaj rad predstavlja detaljno istraživanje uticaja ugradnje različitih zadnjih spojlera na aerodinamiku i stabilnost automobila. Određivanje koeficijenta aerodinamičnosti i uzgona izvršeno je primenom softverskog paketa ANSYS 14.5/ modul Fluid Flow CFX. ...

Ključne reči: *zadnji spojler, aerodinamičnost automobila, koeficijent aerodinamičnosti, koeficijent uzgona, stabilnost automobila*

SIMULATION OF VEHICLE'S INERTIA USING A FLYWHEEL MASS TO TEST DISC BRAKE SYSTEM

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[1]Faculty of Engineering, University of Kragujevac, Kragujevac, Serbia
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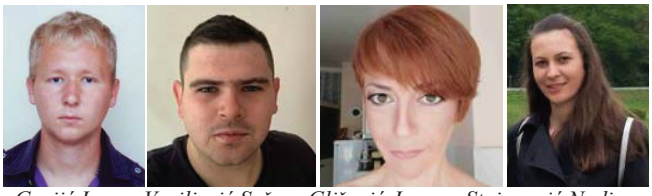

Grujić Ivan Vasiljević Saša Glišović Jasna Stojanović Nadica

ABSTRACT:
The characteristic of all bodies having a certain mass is that during its movement, in addition to all forces acting, the force of inertia also acts. In the case of the translational motion of the body, such as the movement of a vehicle along a straight line, the force of inertia acts. However, in the case of body rotation, the term moment of inertia is introduced. In order to simulate the inertia of a quarter of a moving vehicle moving, but in a laboratory test, this paper presents a methodology for simulating the inertia of a vehicle using a flywheel mass, i.e. a moment of inertia. In this particular case, an analysis of the required rotational speed of the flywheel was performed in order to simulate a specific speed of vehicle and to test the working characteristics of the disc brakes. Knowing the speed of the translational moving of a quarter of the vehicle model and knowing the characteristics of the flywheel mass, and applying the basics of kinetic energy of these two types of motion, a solution was reached about the required rotation speed of the flywheel mass in order to simulate the movement of the vehicle. The conclusion about the rotation speed of the flywheel mass in order to simulate the movement of the vehicle was reached by deriving the equations from kinetic energy.

Keywords: *simulation, moment of inertia, vehicle, braking.*

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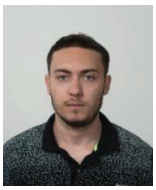
1. INTRODUCTION

The simulation of certain phenomenaoccurring in nature is usually performed in laboratory conditions, with the aim of analysing these phenomena and recognizing certain regularities of their occurrence. When simulating some phenomena, attention must be paid to ensure that all conditions and forces acting at that moment are fulfilled. The simulations in the laboratory havemany advantages over the real-world experiments, allowing repeatability of the experimentunder identical conditions, increased safety and independence from environmental influences that are often a problem in real-world experiment.

ANALYSIS OF GROUNDWATER SOURCE HEAT PUMP OPERATION WITH IMPROVEMENT SUGGESTIONS

ANALIZA RADA TOPLOTNE PUMPE SISTEMA VODA-VODA SA MJERAMA POBOLJŠANJA EFIKASNOSTI RADA

Spago Damir, Mirna Nozic, Safet Isic
Faculty of Mechanical Engineering, University „Džemal Bijedić“ Mostar, Mostar, Bosnia and Herzegovina



Spago Damir *Mirna Nozic* *Safet Isic*

ABSTRACT:
Heat pumps are one of the most used heating and cooling solutions in buildings today, especially in buildings that fall into energy efficienct categories, such as categories A and B. Their advantage, in addition to high energy efficiency, lies in the low or non CO_2 emissions, and corresponds to the tendency of modern building construction.Most commonly used systems are systems which use water, air or ground as a renewable energy source. This paper will present an analysis of the influence of ambient air temperature on the operation of such a system that uses groundwater as a source, as well as measures to improve the performance and reduce the electrical energy consumption.

Keywords: *Heat pumps, energy efficiency, solar energy – PV panels, Geothermal energy*

SAŽETAK:
Toplotne pumpe predstavljaju jedan od najčešće korištenih sistema grijanja i hlađenja u zgradarstvu, gdje se veliki značaj posvećuje energetskoj efikasnosti. Ove sisteme možemo vidjeti pogotovo u zgradama koje spadaju u energetski efikasne kao što su kategorije A i B. Prednost ovih sistema grijanja i hlađenja pored njihove visoke efikasnosti leži i u maloj ili skoro nikakvoj emisiji stakleničkog plina CO_2. Najčešće korišteni sistemi sa toplotnim pumpama su sistemi koji kroiste zrak, zemlju i vodu kao toplotni izvor. U ovom radu će biti prikazana analiza uticaja temperature okolnog zraka na rad toplotne pumpe koja kao toplotni izvor koristi podzemnu vodu, kao i mjere za poboljšanje rada samog sistema, tesmanjenje potrošnje električne energije.

Ključne riječi:*Toplotne pumpe, energetska efikasnost, solarna energija PV-paneli, Geotermalna energija*

AIR STAGING AND REBURNING TO ACHIEVE LOW EMISSIONS DURING CO-FIRING COAL AND BIOMASS

STEPENOVANIM PRIVODOM ZRAKA I REBURNING TEHNOLOGIJOM DO NIŽIH EMISIJA DIMNIH PLINOVA PRI KOSAGORIJEVANJU UGLJA I BIOMASE

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Nihad Hodzic


Anes Kazagic


Kenan Kadic

ABSTRACT:
In this paper results of research of co-firing coals from Middle Bosnian basin with waste woody biomass are presented. The results are related to the emission of flue gas components (CO_2, CO, NO_x and SO_2) with respect to the technological conditions of combustion. In addition to the valorization of the influence of the primary fuel composition and process temperature on the emission values of the flue gas components, it has been shown that the application of primary measures in the combustion chamber results in lower or higher positive effects in terms of reducing the emissions of individual components - e.g. the NO_x emission is reduced from 837 mg/m_n^3 in conventional combustion to 710 mg/m_n^3 using air staging.

Keywords: *biomass, coal, combustion, natural gas, NO_x emission, OFA air*

SAŽETAK:
U radu su predstavljeni rezultati istraživanja kosagorijevanja bosanskohercegovačkih ugljeva iz srednjobosanskog rudarskog bazena sa otpadnom drvnom biomasom. Rezultati se odnose na emisiju komponenti dimnih plinova (CO_2, CO, NO_x i SO_2) s obzirom na tehnološke uvjete sagorijevanja. Pored valorizacije uticaja sastava primarnog goriva i procesne temperature na vrijednosti emisije komponenti dimnih plinova, pokazano je da i primjena primarnih mjera u ložištu rezultira manjim ili većim pozitivnim efektima u pogledu smanjenja emisija pojedinih komponenti - npr. emisija NO_x je sa nivoa od 837 mg/m_n^3 pri konvencionalnom sagorijevanju primjenom stepenovanja zraka smanjena na 710 mg/m_n^3.

Ključne riječi: *biomasa, ugalj, sagorijevanje, prirodni plin, emisija NO_x, OFA zrak*

PROJECTS OF RENEWABLE ENERGY RESOURCES: AN ANALYTICAL OVERVIEW OF THE WIND FARM'S ELECTRICITY GENERATION ON THE HILLSIDE MOŽURA

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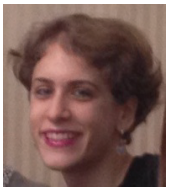

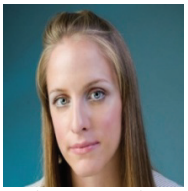

Jovanović Jovana *Sun Xiaoqin* *Đukanović Milena*

ABSTRACT:
Alternative energy management thrives for a long time. ... With the ongoing wind energy projects, an adequate share of wind generator's farms in annual electricity production from renewable energy resources in Montenegro is estimated to be 11.4 %. This paper analyses the concrete exemplar of wind generator's farm, located in hilly area of the southern part of Montenegro, called Možura: the installed power of wind generator's farm; electricity dispatch among constituent parts of wind generator's farm; electricity production within the wind generator's farm; investment analysis; the generated noise level per a wind generator of Možura wind farm and CO_2 emission reductions (savings). Additionally, attached is the prognosis of future development of renewable energy resources up to 2025th year for Montenegro. Logistic metrics, numerical data, and analytical approach are used to underpin this research. Results are analytically, narratively discussed per sections and subsections through tabular displays and graphics, which are added to complete the analysis.
Keywords*: alternative energy management, greenfield investments, renewable energy resources, wind generator's farm, generated noise level*
SAŽETAK:
Upravljanje obnovljivom energijom je u uzgonu već duže vrijeme. ... Sa tekućim vjetro-energetskim projektima, adekvatan udio farmi vjetrogeneratora u godišnjoj proizvodnji električne energije iz obnovljivih energetskih resursa u Crnoj Gori, procjenjuje se da je 11.4 %. Ovaj članak analizira konkretan primjer farme vjetrogeneratora, (koja je smještena u brdovitom području u južnom djelu Crne Gore, nazvanom Možura): njenu instalisanu električnu snagu; prenos električne energije između sastavnih djelova farme vjetrogeneratora; proizvodnju električne energije unutar farme vjetrogeneratora; investicionu analizu projekta; generisani nivo buke po jednom vjetrogeneratoru i smanjenja (uštede) emisija ugljen-dioksida. Dodatno, priložena je prognoza budućeg razvoja obnovljivih energetskih resursa u Crnoj Gori do 2025.godine. Logistička mjerenja, numerički podaci i analitički pristup su upotrijebljeni kao potpora ovom istraživanju. Rezultati su analitički, narativno diskutovani po poglavljima i potpoglavljima članka, kroz tabelarne prikaze i grafikone, koji su dodati radi kompletiranja analize.
Ključne riječi: *upravljanje obnovljivom energijom, ekološka ulaganja, obnovljivi energetski resursi, farma vjetrogeneratora, generisani nivo buke.*

DEVELOPMENT OF HYBRID SYSTEM FOR AIR-CONDITIONING OF ALMOST ZERO ENERGY BUILDINGS

RAZVOJ SISTEMA ZA KLIMATIZACIJU OBJEKATA GOTOVO NULTE ENERGIJE

Edin Šunje[1], Sead Pašić[1], Safet Isić[1], Emir Nezirić[1], Edin Džiho[1]
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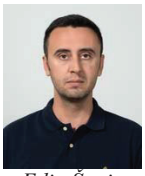

Edin Šunje


Sead Pašić


Safet Isić


Emir Nezirić


Edin Džiho

ABSTRACT:
This paper presents a conceptual design of a hybrid air-conditioning system for buildings, which uses solar energy to heat/reheat water and generate electricity (solar collectors and photovoltaic panels), wind energy to produce electricity (small horizontal or vertical wind generator), and geothermal energy of water or soil in the object environment. The paper presents a pilot plant for a hybrid air-conditioning system at the Faculty of Mechanical Engineering in Mostar and analyzes the efficiency and cost-effectiveness of the system and its individual components.

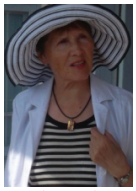
Keywords: *zero-energy buildings, air-conditioning, geothermal energy, solar energy*

SAŽETAK:
U ovom radu predstavljeno je idejno rješenje hibridnog sistema za klimatizaciju objekata koji koristi solarnu energiju za zagrijavanje / ponovno zagrijavanje vode i proizvodnju električne energije (solarni kolektori i fotonaponski paneli), energiju vjetra za proizvodnju električne energije (mali horizontalni ili vertikalni generator vjetra) i geotermalnu energiju vode ili tla u objektnom okruženju. U radu je predstavljeno pilot postrojenje za hibridni sustav klimatizacije na Mašinskom fakultetu u Mostaru i analizira učinkovitost i isplativost sustava i njegovih pojedinih komponenti.

Ključne reči: *zgrade nulte energije, klimatizacija, geotermalna energija, solarna energija*

NEW TECHNOLOGY OF ARTERIAL PIPELINE TUBES FAILURE PREDICTION

Evgeny A. Deulin, Ekaterina I. Ikonnikova
Bauman Moscow State Technical University, MT-11Moscow 105005

E.A.Deulin E.I. Ikonnikova

ABSTRACT:
The presented technology method relates to the distributing and cordial pipelines tubes diagnosing methods and its failure prediction and is based on Nano technological methods. It may be used for the estimation of residual resource of cordial pipelines tubes, which work in long time conditions f variable and state loads. The author's results of steel samples investigation with Secondary ION ass Spectrometry and with Russian Electron Microscopy are presented, that help authors come to new conclusions about the results of transporting gas micro particles friction processes with the tube's wall, which leads to the steel samples destruction. It was shown that the sample microstructure forming process coincides with hydrogen molecules penetration process that influences on the steel properties according the "dry friction" theory being created.

Keywords: *gas, transporting, cordial, tubes, reliability, secondary ion mass spectrometry, failure, prediction, Nano scale, technology*

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1. INTRODUCTION

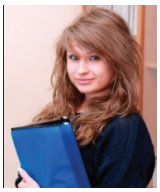
The presented technology [1] relates to the arterial pipelines tubes failure prediction and is based on method of Secondary Ion Mass Spectrometry (SIMS) analysis usage, instead of traditional ones. It may be used for the estimation of residual resource of arterial pipe lines tubes, which work in long time conditions of variable and state loads, and with joint length more 50.000 km.

…

All above-mentioned methods are nondestructive check methods i.e. correspond to nowadays diagnosing orthodox methods. Nevertheless, the diagnosing results interpretation is the main problem of modern diagnosing system creation. The presented method [1] is based on the SIMS analysis usage. The process of hydrogen dissolution in the result of gas flow movement into the arterial gas pipe line tubes in the near surface volume is the adequate valuation of the hydrogen dissolution as the result of so called "dry friction" process [7,8].

FUNCTIONAL MODELING OF THE MEANS FOR HEAT CONSUMPTION MONITORING DURING ITS DESIGN USING THE INFORMATION

Viktoriia Antypenko, Ruslan Okopnyu,Viktor Nenia,
Anna Marchenko, Bohdan Antypenko
Sumy State University, Faculty of Electronics and Information Technologies, Sumy, Ukraine





V. Antypenko *R. Okopnyu* *V. Nenia* *A. Marchenko* *B. Antypenko*

ABSTRACT:
This article presents a complex method of functional modeling for technical objects with different levels of detail description. During decomposing, the main function of a technical object is represented by simpler functions which are performed sequentially and in parallel. Several types of functions formalized description such as graphical, tabular and analytic one are presented. General descriptions of IDEF0 functional modeling methodology have been inherited and partially modified and supplemented according to the requirements of engineering practice. As a result, it allows getting quantification of technical objects. Thus, a well-grounded complex method of functional modeling for technical objects is developed. It has been tested practically on the methodology for designing and controlling the process of heat consumption monitoring in the apartment building.

Keywords: *formal description, information technology, regulator, controller, weather dependent control, remote control, monitoring system, heating system, saving energy resources, energy efficiency.*

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1. INTRODUCTION

Nowadays, the transition to the design and manufacturing of technical objects as “smart” objects has become an important direction of technology development. Such technical objects include both means of performing the basic functional purpose and computers (controllers), as well as software and information support. They recognize changes of both the external environment and their own state, effects on themselves and change the parameters of their functioning accordingly. This direction of the technology development is supported by the INCOSE International Systems Engineers Council and envisaged by the Industry 4.0 strategy of Industrial Development.

RENEWABLE ENERGY SOURCES IN CONSTRUCTION OF ENERGY EFFICIENT RESIDENTIAL BUILDINGS

OBNOVLJIVI IZVORI ENERGIJE U IZGRADNJI ENERGETSKIH EFIKASNIH STAMBENIH ZGRADA

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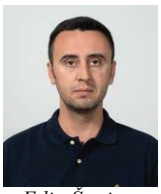
Miron Torlo


Ismar Kreso


Edin Šunje

ABSTRACT:
Energy consumption is increasing every day, which is why renewable energy is increasingly being offered as one of the most important solutions in the fight against climate change and the energy crisis. Exactly one of these forms is solar energy. Solar radiation is directly converted to heat or electricity. The conversion is done by different devices, some of which are photovoltaic cells for generating electricity.
This paper shows how to increase energy efficiency in residential buildings by using photovoltaic cells. The materials for making them are described, and the principles of operation of photovoltaic cells are explained. One of the new structural solutions has been arranged, the method of their mounting is shown, and the technical and economic analysis of these solutions is given.

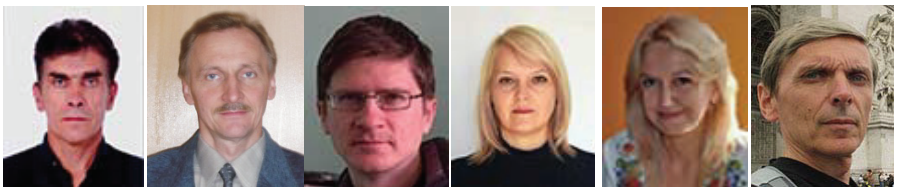
Keywords: *energy efficency, sunlight, photovoltaic cells,*

SAŽETAK:
Potrošnja energije raste svakim danom, zbog čega se obnovljiva energija sve više nudi kao jedno od najvažnijih rješenja u borbi protiv klimatskih promjena i energetske krize. Upravo jedan od ovih oblika je solarna energija. Solarno zračenje se direktno pretvara u toplinu ili električnu energiju. Konverziju provode različiti uređaji, od kojih su neki fotonaponske ćelije za proizvodnju električne energije.
Ovaj rad prikazuje kako povećati energetsku efikasnost stambenih zgrada upotrebom fotonaponskih ćelija. Opisani su materijali za njihovu izradu, a objasnjeni su principi rada fotonaponskih ćelija. Uređeno je jedno od novih strukturnih rješenja, prikazana je metoda njihove ugradnje i data je tehnička i ekonomska analiza tih rješenja.

Ključne reči: *energetska učinkovitost, sunčeva energija, fotonaponske ćelije, integrisani solarni paneli, izolacija korva, montaža krova.*

COMPUTER STUDIES OF THE TIGHTNESS OF THE DRILL STRING CONNECTOR DEPENDING ON THE PROFILE OF ITS TAPERED THREAD

Oleh Onysko, Lubomyr Borushchak,Volodymyr Kopei, Tetiana Lukan, Iulia Medvid, Viktor Vriukalo
Ivano-Frankivsk National Technical University of oil and gas



O. Onysko L. Borushchak V. Kopei T. Lukan I. Medvid V. Vriukalo

ABSTRACT:
Drill connector is named as tool-joint play an important role in ensuring theimpermeabilityofthedrillstring. The tightness closure of the ends of the box and the pin depends on the contact pressure between the ends of the box and the pin of the on one hand and the pressure of the drilling fluid inside of the pipe on the other hand. In common tool-joint, the contact pressure must exceed the pressure of the drilling fluid inside the drill string. Computer studies conducted by the authors in the SOLIDWORKS Float Simulation show the reduce of the effect of the drilling fluid pressure on the amount of contact pressure between the ends of the box and the pin in the process of initial depressurization.

Keywords: *drill tool-joint, mud fluid, tapered thread, hydraulic simulation, thread surfaces*

1. INTRODUCTION

Tightness is one of the main operational indicators of the drill string.This indicator is both an influential factor for the environment preservation and for the loss of hydraulic energy during drilling [1]. Ispecially hydrosphere as a part of the multicomponent dynamic system that is influenced by oil and gas drilling engineering is depended on it [2]. In addition the process of drilling oil and gas wells is the source of air pollution through drilling mud evaporation containing hazardous chemical substances [3]. Through the cavity of the drill string under a significant pressure up to 10 - 20 MPa drill wash solution is pumped. This solution is the main source of water and air pollution during drilling. Therefore, avoiding its losses due to the leakage from the drill string is an urgent task.The drill string consists mainly of drill pipes.

DESIGN AND TESTING OF A TWO-STAGE WATER-HYDRAULICS PRESSURE-RELIEF VALVE

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University of Ljubljana, Faculty of Mechanical Engineering

Franc Majdič

ABSTRACT:
Power-control hydraulics isan important technology used in many industries, but itcan be problematic due to itsimpact on the environment. Using water instead of mineral hydraulic oil is one of the waysto protect our environment. However, there is a lack of components suitable for water hydraulics.
The aim of this work was to design and test atwo-stage pressure-relief valve, appropriate for use in awater-hydraulics system. The valve was designed for pressures up to 40 MPa and for flow rates up to 50 l/min. In the design process we used both analytical and numerical approaches. One of the important goals was forthe valve to beas simple as possible to manufacture. The prototype of the valve was madeand the basic measurements were taken. Based on the first results obtained from the experiments, the valve design was modified in the direction of a simpler valve-manufacturing process with higher quality.

Keywords: *water hydraulics, pressure-relief valve, design, analysis, measurements*

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1. INTRODUCTION

Nowadays we cannot imagine life without technology; it is almost universal. One of the important waysthat power is transferred is with hydraulics, where a fluid is used for the power transfer [1, 2]. Different kinds of hydraulic fluids are in use, the most used are hydraulic mineral oils (a more than 80% share) [5].Most of these hydraulic fluids are hazardous to the natural environment and to humans.Unfortunately, hazardous hydraulic fluids spill into the environment frequently. There are three possible solutions, the first is to use biodegradable oils, the second is to use ecology-friendly ionic liquids and the third is to use water as a hydraulic fluid [5, 6].If we want to change from oil to water hydraulics, a lot of different hydraulic componentsare needed [1, 3, 4]. An important missing component is the two-stage pressure-relief valve.

DEVELOPMENT OF LINEAR SERVO HYDRAULIC DRIVE FOR MATERIAL TESTING

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Vito Tič *Darko Lovrec*

ABSTRACT:
Material testing devices are used in laboratory and industrial environments for testing and research in fracture mechanics and are typically operated by servo-hydraulic or servo-pneumatic actuators. They contain an increasing number of electronic and microprocessor-controlled components, with which they achieve appropriate dynamics and the ability to store and process signals. The paper presents the development, implementation and operation of a flexible device for testing the dynamic strength of materials based on linear electro-hydraulic servo drive with closed loop force control. To control the components, a Beckhoff multi-core controller is used, which simultaneously runs a control program with real time force control, as well as a human-machine interface in the Windows environment. The presented device is capable of achieving forces up to 40 kN at test speeds up to 20 Hz.

Keywords: *servo, hydraulic, linear drive, material testing*

1. INTRODUCTION

The development of new materials requires an understanding of their mechanical properties, one of the most important being their fatigue behaviour. The main purpose of such tests is to ensure the safety of the components and devices when used [1-3]. Bearing in mind that theoretical equations do not always correspond to the material's real behaviour, determining the durability of materials by experimental procedures is all the more important [4]. In order to investigate the main causes of material fraction (failure of engineering component) subjected to uniaxial and / or multi-axial loading, mechanical fatigue tests must be carried out in different regimes and in a wide variety of materials [5].

Several specialized devices have been identified in the literature that authors have designed and built for specific materials testing applications [6–10]. In the field of fatigue testing machines, however, the market is saturated with expensive dedicated test devices that can operate in very different frequency regimes [10]. Recent research is focused on the development of devices that achieve material fatigue through resonant systems or actuators [11,12].

PROCEDURE FOR DETERMINING THE WIND TUNNEL BLOCKAGE CORRECTION FACTOR

POSTUPAK ODREĐIVANJA KOEFICIJENTA KOREKCIJE EFEKTA BLOKADE U ZRAČNOM TUNELU

Ernad Bešlagić[1], Samir Lemeš[2], Fuad Hadžikadunić[3]
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[2]Polytechnic faculty, University of Zenica


Ernad Bešlagić


Samir Lemeš


Fuad Hadžikadunić

ABSTRACT:
Before launching a new wind turbine, it is necessary to determine its output performance. The performance can be achieved either by testing the complete wind energy converter in actual operating conditions in the natural environment or by testing the wind turbine in a wind tunnel. In addition to the many advantages offered by wind tunnel testing, there are also some disadvantages. One of them is the appearance of a blockage effect that occurs when wind turbines are tested in a closed test section of a wind tunnel. The paper briefly explains the existing methods for determining the correction factor which corrects the measured wind turbine output in a wind tunnel in order to eliminate the blockage effect. This paper is part of a project aimed at determining the blockage correction factor for helicoidal Darrieus wind turbines. This stage of the project consists of an experimental design for testing which will be carried out in an open wind tunnel with a closed test section, constructed from scratch at the university laboratory.

Keywords: *wind tunnel, vertical axis wind turbine, blockage effect*

SAŽETAK:
Prije puštanja nove vjetroturbine na tržište potrebno je odrediti njene izlazne performanse. Do tih performansi je moguće doći bilo testiranjem kompletnog vjetroagregata u stvarnim operativnim uslovima u prirodnom okruženju bilo testiranjem vjetroturbine u zračnom tunelu. Pored brojnih prednosti koje nude testiranja u zračnom tunelu, postoje i određeni nedostaci istih. Jedan od tih nedostataka je i pojava efekta blokade koja se javlja prilikom testiranja vjetroturbina u zatvorenoj testnoj sekciji zračnog tunela. U radu su ukratko objašnjene postojeće metode za određivanje korekcionog koeficijenta kojem se koriguju izmjerene izlazne performanse vjetroturbine u zračnom tunelu u cilju eliminacije efekta blokade. Ovaj rad je dio projekta čiji je cilj određivanje koeficijenta korekcije efekta blokade za helikoidneDarrieus-ove vjetroturbine. U ovoj fazi projekta napravljen je, i u ovom radu prezentovan, svojevrstan plan eksperimenta za testiranja koja će se obaviti u otvorenom zračnom tunelu sa zatvorenom testnom sekcijom čija izgradnja je u završnoj fazi na Mašinskom fakultetu u Zenici.

Ključne riječi: *zračni tunel, vertikalne vjetroturbine, efekat blokade*

TREND ANALYSIS OF PRODUCTION AND DISTRIBUTION OF WING PUMPS: A CASE STUDY OF FIRM PPT-TRSTENIK (SERBIA)

ANALIZA TRENDA PROIZVODNJE I DISTRIBUCIJE KRILNIH PUMPI: STUDIJA SLUČAJA FIRME PPT-TRSTENIK (SRBIJA)

Milutin Živković[1], Predrag Dašić[1,2], Milan Radosavljević[3], Maja Anđelković[4]
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Milutin Živković *Predrag Dašić* *Milan Radosavljević* *Maja Anđelković*

ABSTRACT:
Considering the current state of production and marketing of hydraulic devices and systems in Serbia and world-renowned manufacturers, significant indicators and trends can be observed. Modern structural and production solutions for hydraulic devices are based on the application of new technologies and the introduction of new production capacities, processes and materials in the process of making or revitalizing existing devices and assemblies. As a significant activity of mechanical engineering, the hydraulics industry is also a reference of the level of development of the national economy of a country and the basis for profit. This paper presents the trend analysis and statistical modeling of production and distribution of wing pumps of the PPT firm from Trstenik (Serbia). ....

Keywords: *Statistical analysis, new technologies, production, distribution, wing pump (WP).*

SAŽETAK:
Sagledavajući trenutno stanje u proizvodnji i plasmanu hidrauličkih uređaja i sistema u Srbiji i svetski poznatih proizvođača, mogu se uočiti značajni pokazatelji i trendovi. Savremena konstruktivna i proizvodna rešenja hidrauličkih uređaja zasnovana su na primeni novih tehnologija i uvođenjenje novih proizvodnih kapaciteta, postupaka kao i materijala u procesu izrade ili revitalizacije postojećih uređaja i sklopova. Kao značajna delatnost mašinogradnje, industrija hidraulike predstavlja i referentnost nivoa razvoja nacionalne privrede neke zemlje i osnov za ostvarivanje profita. U radu je prikazana analiza trenda i statističko modeliranje proizvodnje i distribucije krilnih pumpi firme PPT iz Trstenika (Srbija). ....

Ključne riječi: *Statistička analiza, nove technologije, proizvodnja, distribucija, krilne pumpe (WP).*

WOOD AS A BUILDING MATERIAL – RENEWABLE SOURCE TO PRESERVE THE ENVIRONMENT AND HEALTH IN B&H

DRVO KAO GRAĐEVINSKI MATERIJAL – OBNOVLJIVI IZVOR S CILJEM OČUVANJA OKOLIŠA I ZDRAVLJA U BIH

Sanela Klarić[1], Sarina Šabotić[1]
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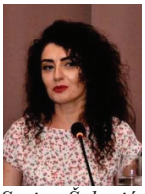

Sanela Klarić *Sarina Šabotić*

ABSTRACT:
The building sector, which contributes towards Greenhouse gas (GHG) emissions with an amount of approximately one third, has the largest potential to cut energy consumption, as well as current pollution, through the use of local, natural, renewable and organic materials. The subject of the present paper is the comparison of calculated amounts of the CO_2 emissions, energy demand for heating, as well as Global Warming Potential (GWP), which was conducted through the comparative analysis of reconstructions of schools in Bosnia and Herzegovina (B&H) and the on-going EU "Renew School" project. The final results show that B&H is significantly trailing the European Union (EU) energy efficiency standards for buildings when focused on energy demand for heating, and Global Warming Potential. In contrast, return to B&H`s traditional wood products industry as the primary source of construction material would yield many possible benefits including social-economic development, reduction of CO_2 emissions, and improving the environment through the reduction of construction waste.
Keyword: *wood, energy efficiency, CO_2 reduction, new technologies in school renovations*

SAŽETAK:
Građevinski sektor, koji doprinosi efektu staklene bašte s količinom od otprilike jedne trećine, ima najveći potencijal za smanjenje potrošnje energije, kao i trenutnog zagađenja, korištenjem lokalnih, prirodnih, obnovljivih i organskih materijala. Predmet ovog rada je poređenjeproračunatih količina emisije CO_2, potrošnje energije za grijanje, kao i potencijala globalnog zagrijavanja, kojejesprovedeno komparativnom analizom rekonstrukcije škole u Bosni i Hercegovini i škole u EU u okviru tekućeg projekta „Renew School“. Konačni rezultati pokazuju da BiH značajno zaostaje za standardima EU u pogledu energetske efikasnosti zgrada, posebno u smislu potrošnje energije za grijanje i potencijala globalnog zagrijavanja. Nasuprot tome, povratak bosansko – hercegovačkoj tradicionalnoj drvnoj industrijikao primarnom izvoru građevinskog materijala donio bi mnoge koristi, uključujući socijalno-ekonomski razvoj, smanjenje emisije CO_2 i očuvanje okoliša kroz smanjenje građevinskog otpada.
Ključne riječi: *drvo, energetska efikasnost, smanjenje CO_2, nove tehnologije u obnovi škola*

TOWARDS INNOVATIVE SOLAR ENERGY APPLICATIONS: NEW URBAN FURNITURE

KA INOVATIVNIM PRIMJENAMA SOLARNE ENERGIJE: NOVI URBANI MOBILIJAR

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Marija Bojović

ABSTRACT:
As every society produces its own space, in the age of sustainability, it is inevitable to rethink the ways we live and use our cities and our resources. Smart cities are an emerging topic - this next generation of urban development requires technologically advanced, socially equitable and last, but not least, well-designed urban environments. At this crucial moment of rethinking our space and cities we are given the opportunity to redesign them as more flexible, adaptable and, citizen-focused. This paper analyses two such examples of well-designed, innovative implementation of solar energy into urban settings.

Keywords: *applied solar energy, smart city, Montenegrin solar bench, flexible urban furniture, participative design*

SAŽETAK:
Budući da svako društvo proizvodi svoj prostor, u eri održivosti neminovno je ponovo promisliti način na koji živimo i koristimo svoje gradove i resurse. Pametni gradovi su sve aktuelnija tema, a naredna generacija urbanog razvoja zahtijeva tehnološki napredne, socijalno pravedne i, ne manje važno, dobro dizajnirane urbane sredine. U ovom ključnom momentu ponovnog promišljanja našeg prostora i gradova, imamo priliku da ih redizajniramo kao fleksibilnije, prilagodljive i sa fokusom na čovjeku. Ovaj rad analizira dva takva primjera uspješno dizajniranih, inovativnih primjena sunčeve energije u urbano okruženje.

Ključne riječi: *primijenjena solarna energija, pametni grad, crnogorska solarna klupa, fleksibilni urbani mobilijar, participativni dizajn*

CARBON BASED AEROGELS AND XEROGELS FOR REMOVING OF TOXIC ORGANIC COMPOUNDS

AEROGELOVI I KSEROGELOVI NA BAZI UGLJIKA ZA UKLANJANJE TOKSIČNIH ORGANSKIH SPOJEVA

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Amra Bratovcic Irena Petrinic

ABSTRACT:
In recent years with the rapidly growing industries and population, water pollution has emerged as major challenge for scientific community that demands an intense and real-world solution. Carbon based aerogels and xerogels are exceptional classes of porous materials with a number of excellent physicochemical properties such as low density, high porosity, high surface area and adjustable surface chemistry. Thesematerialspossess an extraordinary adsorption capacity for the removal of toxic organic compoundsfrom the environment. This article aims to give an overview regarding the capacity adsorption of different organic solvents, endocrine disrupting compounds, painkillers, antibiotics and dyes on the carbon aerogels and xerogels in water solutions.

Keywords: *carbon aerogel, carbon xerogel, adsorption, organic compounds*

SAŽETAK:
Posljednjih godina, s naglim porastom industrije i stanovništva, zagađenje pitkih voda postalo je glavni izazov znanstvenoj zajednici koje zahtijeva primijenjena rješenja. Aerogelovi i kserogelovi na bazi ugljika iznimna su klasa poroznih materijala s nizom izvrsnih fizikalno-kemijskih svojstava kao što su niska gustoća, velika poroznost, velika površina i podesiva kemija površine. Ovi materijali posjeduju izvanrednu adsorpcijsku sposobnost uklanjanja toksičnih organskih spojeva iz okoliša. Ovaj članak daje pregled u pogledu adsorpcijskog kapaciteta različitih organskih otapala, spojeva koji ometaju endokrini sustav, lijekova protiv bolova, antibiotika i sintetičnih bojila na ugljičnim aerogelovima i kserogelovima u vodenim otopinama.

Ključne riječi: *ugljični aerogel, ugljični kserogel, adsorpcija, organski spojevi*

SUPERCRITICAL FLUID EXTRACTION OF LYCOPENE AND OMEGA-3

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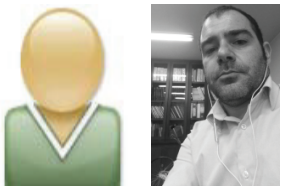

M. Margotta M. C. De Simone

ABSTRACT:
An ideal extraction method should be rapid, produce a quantitative recovery without degradation and the extracts should be easily separated from the solvent. Supercritical fluid technology offers features that overcome many limitations of conventional extraction methods. There are many advantages to their application, especially in the food sector (for example the extraction of lycopene from tomato skins or the extraction of fish oil rich in omega-3 from fish by-products); the extraction method influences the yield and quality of the product obtained, and also allows to operate with moderate temperatures and with shorter timescales. The processes involving SCF are sustainable, environmentally friendly and cost efficient, and offer the possibility of obtaining new products.The disadvantage, however, lies in the fact that it is necessary to use expensive equipment and to perfect the particular phases of the process to obtain a specific product.

Keywords: *Supercritical Fluids Extraction, Supercritical Carbon Dioxide, Supercritical Fluids Fractionation, Lycopene, Omega-3Fatty Acid.*

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1. INTRODUCTION

The application of supercritical fluids as an alternative to conventional processes of precipitation, separation and extraction it is a field of research in continuous innovation.
The use of supercritical CO_2 offers innumerable advantages, including moderate operating temperature, density and solvent power that can be easily adjusted thanks to a minimum change in temperature or pressure, flammability and low cost.
Nowadays, SC-CO_2 is used for large-scale extractions in the food industry, as an alternative to traditional separation systems, such as fractional distillation, steam current extraction, extraction with organic solvents.
A large application of supercritical fluids occurs in the agro-industrial field, above all for the recovery of nutrients from processing waste. In fact, in the last few years the concept of "zero waste" has become increasingly aware: waste can be reused within the food production chain. Many residues, in fact, are rich in bioactive species[1].

ASSESSMENT OF CANCEROGENIC HEALTH RISK OF As, Cd, Pb AND Ni FROM TOBACCO SMOKE

PROCJENA KANCEROGENOG RIZIKA PO ZDRAVLJE OD As, Cd, Pb I Ni IZ DUHANSKOG DIMA

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Alma Leto


Aida Šukalić


Alma Mičijević

ABSTRACT:
The aim of this study was to determine the cancerogenic risk to human health of As, Cd, Pb, and Ni intake via cigarette tobacco smoke, made primarily from indigenous Herzegovina tobacco varieties. Since such research has never been done on these Herzegovina varieties VH, VH32, and Ravnjak, they radically compared the possibilities next to them, examining the cultivar Virginia and Berley, also produced in BiH. Samples were taken from 16 localities, namely, all localities in BiH today. Samples were used per insertion, from medium insertions, such as the highest quality, handmade cigarettes that were later dropped on smokers, and the smoke condensate tested for Cd, Pb, As, and Ni content. A tobacco smoke cancerogenic risk assessment was made after setting up the CSF by the US EPA, assuming that 1 pack of cigarettes is smoked daily.

Keywords: *Tobacco, smoke, As, Cd, Pb, Ni, carcinogenic risk*

SAŽETAK:
Cilj ovog rada bio je odrediti kancerogeni rizik po zdravlje ljudi unosom As, Cd, Pb i Ni putem duhanskog dima iz cigareta napravljenih prvenstveno od autohtonih hercegovačkih sorti duhana. Budući da jedno ovakvo istraživanje nikada prije nije rađeno na ovim hercegovačkim sortama VH, VH32 i Ravnjak, radi mogućnosti poređenja pored njih, ispitvanja su vršena i na sortama Virdžinija i Berlej, a koje se također proizvode na području BiH. Uzorci ovih pet sorti duhana uzeti su sa 16 lokaliteta tj, sa svih lokaliteta na kojima se danas u BiH proizvodu duhan. Uzeti su uzorci po insercijama, a od srednjih insercija, kao najkvalitetnijih, ručno su napravljene cigarete koje su kasnije ispušene na pušačkoj mašini, a dimni kondenzat ispitivan na sadržaj Cd, Pb, As i Ni. Procjena rizika od kancerogena iz duhanskog dima je izračunata prema setu CSF Američke agencije za zaštitu životne sredine (US EPA) pod pretpostavkom da se dnevno puši 1 kutija cigareta.

Ključne riječi: *duhan, dim, cigarete, As, Cd, Pb, Ni, kancerogeni rizik*

APLICATION OF ECO-COMPATIBILE TEHNOLOGY – PHYTOREMEDIATION – CASE STUDY WITH PHYTOACCUMULATOR PLANTAGO LANCEOLATA

PRIMJENA EKO-KOMPATIBILNE TEHNOLOGIJE – FITOREMEDIJACIJA – STUDIJA NA SLUČAJU SA FIROAKUMULATOROM PLANTAGO LANCEOL

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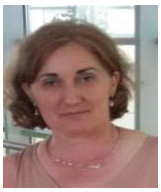


F. Muhamedagić *M. Cero*

ABSTRACT:
Phytoremediation is known as eco-compatible technologies in an environmentally friendly technology segment. This paper presents the results of phytoremediation using wild facultative natural phytoaccumulation of the natural habitat of Plantago lanceolata L. The analyzed included 18 samples from three locations. All locations are located in Una National Park, namely: the first location – Kalati, second location – Cukovi and third location – Rajnovac. The AAS method was used to determine the total content (mg/kg) of the toxic element in soil and plant samples. The results are presented in the values of the phytoaccumulation factors – PF. According to the obtained PF factor values, Plantago lanceolata conducted a moderate phytoaccumulation of cadmium and arsenic, while for nickel conducted to be a low phytoaccumulation.

Keywords: *eco-compatibile technologies, phytoremediation, Plantago Lanceolata, phytoaccumulation factor (PF)*

SAŽETAK:
Fitoremedijacija je poznata kao ekokompatibilna tehnologija u segmentu okolišno prihvatljivih tehnologija. U ovom radu predstavljeni su rezultati primjene fitoremedijacije korištenjem fakultativnog prirodnog fitoakumulatora Plantago lanceolata L. iz prirodnog okoliša. Analizirano je ukupno 18 uzoraka sa tri lokaliteta. Sve lokacije su se nalazile na području Nacionalnog Parka “Una” i to: prva lokacija – Kalati, druga lokacija – Cukovi i treća lokacija – Rajnovac. Korištena je AAS metoda kod određivanja ukupne koncentarcije (mg/kg) toksičnih elemenata u uzorcima tla i biljnom materijalu. Rezultati su predstavljeni u vrijednostima fitoakumulacijskog faktora – FF. Prema dobivenim vrijednostima faktora FF Plantago lanceolata se pokazao kao umjeren fitoakumulator za kadmij i arsen, dok je za nikal se pokazao kao nizak fitoakumulator.

Ključne riječi*: eko-kompatibilna tehnologija, fitoremedijacija, Plantago lanceolata, fitoakumulacijski faktor (FF)*

HUMAN RISK ASSESSMENT BASED ON THE CONTENT OF INORGANIC AND ORGANIC POLUTANTS IN SARAJEVO'S PLAYGROUNDS

PROCJENA ZDRAVSTVENOG RIZIKA BAZIRANA NA SADRŽAJU ANORGANSKIH I ORGANSKIH POLUTANATA SA SARAJEVSKIH IGRALIŠTA

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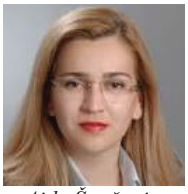
Aida Šapčanin


Ekrem Pehlić


Mirsada Salihović


Alisa Smajović

ABSTRACT:
Soil is an important part of ecosystem actively involved in the natural cycle of substances, so it is necessary to investigate the content of pollutants and to establish preventive measures on this basis in order to reduce soil pollution, and thus preserving the flora and fauna, as well as human health. The main objective of this study was the human risk assessment based on the content of inorganic and organic polutants in the soil of children playgrounds.The contents of inorganic pollutants such as Cd, Pb, Cr, Ni, Cu, Zn, Co, Se and As, and organic pollutants such as naphtalene, fluoranthene and benzo(a)pyrene have been measured in Sarajevo's playgrounds soil and the HQ and HI have been calculated. Risk characterization relevant for the present investigation comprises calculations of non-carcinogenic risk for ingestion and inhalation of soil.Our results suggest that children are at higher risks than the adults due to their contact with potentially polluted soil.

Key words: *soil, inorganic pollutants, organic polutants, playgrounds, health risk assessment.*

REZIME:
Tlo je važan dio ekosistema koji je aktivno uključen u prirodne cikluse tvari i stoga je neophodno ispitati sadržaj polutanata i uspostaviti preventivne mjere u smislu smanjenja zagađenosti tla i time sačuvati floru i faunu kao i ljudsko zdravlje.Glavni cilj ovoga rada je procjena zdravstvenog rizika koja se bazira na sadržaju anorganskih i organskih polutanata u tlu dječijih igrališta. Sadržaj anorganskih polutanata poput Cd, Pb, Cr, Ni, Cu, Zn, Co, Se i As, i organskih polutanata poput naftalena, fluorantena i benzo(a)pirena je izmjeren u tlu sarajevskih igrališta i izračunati su HQ i HI. Karakterizacija rizika relevantna za ovo istraživanje sastoji se od proračuna nekarcinogenog rizika ingestijom i inhalacijom tla. Naši rezultati sugeriraju da su djeca pod većim rizikom nego odrasli radi njihovog kontakta sa potencijalno zagađenim tlom.

Ključne riječi: *tlo, anorganski polutanti, organski polutanti, igrališta, procjena zdravstvenog rizika.*

INFLUENCE OF ALCOHOL CONTENT IN INTIAL DISTILLATE ON DISTRIBUTION OF METHANOL AND HIGHER ALCOHOLS DURING REDESTILATIONS

UTICAJ SADRŽAJA ALKOHOLA U POLAZNOM DESTILATU NA DISTRIBUCIJU METANOLA I VIŠIH ALKOHOLA U TOKU REDESTILACIJE

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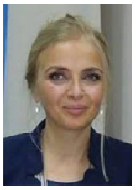

Nudžejma Jamaković Nermina Spaho

ABSTRACT:
Quality of strong alcoholic beverage depend on quantity and quality of volatile compounds, that can exhibit both positive (esters, higher alcohols) and negative effects (methanol). In order to improve the sensory quality of the products but also to improve the quality from a toxicological point of view, the aim is to minimize the effect of less desirable components, and highlight the effect of more desirable components. The aim of this paper is to examine how the amount of alcohol in initial distillate influence on evaporation dynamics of methanol and higher alcohol during redistilltions.The results showed (spectrophotometric method) that in the low-alcoholic mixtures significantly higher content of higher alcohols are separated in the first fraction, and least of all in last fraction. In the same time the content of methanol was higher in last fraction, than in the first fraction, although it is difficult to separate methanol from ethanol. Opposite dynamics of those compounds were evident in redistillation of high-alcoholic mixtures.

***Keywords**: distillation, methanol, higher alcohols*

SAŽETAK:
Kvalitet jakih alkoholnih pića zavisi od kvantiteta i kvaliteta isparljivih jedinjenja, koja mogu ispoljiti svoje pozitivno (esteri, viši alkoholi), ali i negativno djelovanje (metanol). Radi poboljšanja senzornog kvaliteta pića ali i radi poboljšanja kvaliteta sa toksikološkog aspekta, nastoji se što je moguće više minimizirati efekat manje poželjnih komponenti, a istaknuti efekat poželjnijih komponenti. Cilj ovog rada je ispitati kako sadržaj alkohola u polaznom destilatu utiče na dinamiku isparenja metanola i viših alkohola u toku redestilacije. Rezultati su pokazali (metoda spektrofotometrije) da se kod slaboalkoholnih smjesa značajno više viših alkohola izdvoji u prvencu, a najmanje u patoci. U isto vrijeme sadržaj metanola je veći u patoci, nego u prvencu, mada je teško odvojiti metanol od etanola.Suprotna dinamika isparenja ovih jedinjenja je evidentirana u redestilaciji visokoalkoholnih smjesa.

***Ključne riječi**: destilacija, metanol, viši alkoholi*

COMPARATIVE COMPOSITION OF SPREČA RIVER FAUNA (BOSNIA AND HERZEGOVINA)

KOMPARATIVNI SASTAV FAUNE SLIVA RIJEKE SPREČE (BOSNA I HERCEGOVINA)

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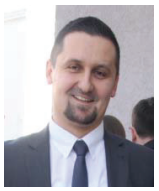
Faculty of Natural Sciences and Mathematics, University of Tuzla, Tuzla, Bosnia and Herzegovina


Isat Skenderović


Avdul Adrović


Edina Hajdarević


Alen Bajrić

ABSTRACT:
Hydrobiological studies of the macroinvertebrates of the water catchment area of the river Spreča during 2019 revealed the presence of 60 taxa classified into 5 classes and 11 groups. Qualitative-quantitative analysis of the studied watercourses revealed different presence of individuals and taxa. The results of the analysis showed the dominant participation of the Insecta class with 6 groups. Other established classes are represented by a smaller number of groups. The results of the diversity index indicate the heterogeneous composition of the macroinvertebrate communities. The highest values of the Shannon - Weaver Diversity Index were found on the Oskova River - Mačkovac locality. On all other sites, the percentage of similarities was much smaller. Ichthyological analysis of the Spreče River basins revealed the presence of 24 fish species from 6 families.

Key words: *fauna, biodiversity, Spreča*

SAŽETAK:
Hidrobiološka istraživanja makroinvertebrata sliva rijeke Spreče tokom 2019.godine su pokazala prisustvo 60 taksona svrstanih u 5 klasa odnosno 11 grupa. Kvalitativno- kvantitativna analiza istraživanih vodotoka je pokazala različito prisustvo jedinki i taksona. Rezultati analize su pokazali dominantno učešće klase Insecta sa 6 grupa. Ostale ustanovljene klase su zastupljene s manjim brojem grupa. Rezultati indeksa diverziteta ukazuje na heterogen sastav zajednicama kroinvertebrata. Najveće vrijednosti Shannon – Weaver- ovog indeksa diverziteta su konstatovani na rijeci Oskovi – lokalitet Mačkovac. Na svim ostalim istraživanim lokalitetima procenat sličnosti je znatno manja. Ihtiološka istraživanja rijeka sliva Spreče su pokazala prisustvo 24 vrste riba iz 6 porodica.

Ključneriječi: *fauna, biodiverzitet, Spreča*

PROPOSED NEW QUALITY CONTROL PLAN PROCEDURE FOR ROAD BRIDGES

PRIJEDLOGNOVOGPOSTUPKA PLANA NADZORAKVALITETE ZA CESOVNEMOSTOVE

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Naida Ademović

ABSTRACT:
COST Action TU 1406 gathered experts for the scientific field and practitioners that worked together for four years from 2014 to 2019. One of the main outputs of this Cost Action was the development of the procedure forthe Quality Control Plan (QCP) for the road bridges. The starting point for development were results obtained by three working groups (WGs) obtained from a wide-ranging and exhaustive work. The result was a list of applicable Performance Indicators (PI), clear instructions on Performance Goals (PG) and proposal of the quality control plan. A new procedure was developed for the implementation of developed guidelines. The idea was to produce a unique method that would be applicable todifferenttypes of bridges (frame, girder, arch, and truss)at the European level regardless of the specific formulations of the QCP in each country.

Keywords: *road bridges, Quality Control Plan, qualitative analysis, COST TU 1406, key performance indicators*

SAŽETAK:
COST Action TU 1406 okupio je stručnjake iz nauke i prakse koji su zajedno radili četiri godine od 2014. do 2019. Jedan od glavnih rezultata ovog projekta bio je razvoj postupka za Plan kvalitete (QCP) za cestovne mostove. Polazna točka bili su rezultati tri radne skupine (WGs) dobiveni iz širokog i iscrpnog rada. Rezultat su bili popis primjenjivih pokazatelja ponašanja (PI), jasne upute za ciljeve izvedbe (PG) i prijedlog plana kontrole kvalitete. Razvijen je novi postupak za primjenu formiranih smjernica. Ideja je bila proizvesti jedinstvenu metodu koja bi bila primjenjiva na različite tipove mostova (okvira, grednih nosača, luka i rešetki) na europskoj razini bez obzira na specifične formulacije QCP-a u svakoj zemlji.

Ključne riječi: *cestovni mostovi, Plan kontrole kvalitate, kvalitativna analiza, COST TU 1406, ključni indikatori ponašanja*

PROBLEM OF CHARACTERISTIC SNOW LOAD IN THE EASTERN PART OF BOSNIA AND HERZEGOVINA

PROBLEM KARAKTERISTIČNOG OPTEREĆENJA SNIJEGOM U ISTOČNOM DIJELU BOSNE I HERCEGOVINE

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Rašid Hadžović


Bakir Krajinović

ABSTRACT:
In and through this paper we analyzed the characteristic snow load in the eastern part of Bosnia and Herzegovina. We cross-referenced the data from the map of characteristic snow load map with the data of snow depth in the same area during the period 1970 – 1980 as well as the maximum snow depth data from the January of 1976. The values of snow load are increased in respect to the period prior to defining the map of load in 2018, raising certain doubts with several design engineers. This paper demonstrated that the assigned values of characteristic snow load are realistic and applicable in construction projecting.

Keywords:*characteristi csnow load, snow load map, Eastern part of Bosnia and Herzegovina*

SAŽETAK:
Kroz ovaj rad analizirali smo karakteristično snježno opterećenje u istočnom dijelu Bosne i Hercegovine. Analiziramo podatke sa kartekarakterističnih opterećenja snijega s podacima o visini snijega na istom području u razdoblju 1970. - 1980., kao i podacima o maksimalnoj visini snijega iz januara 1976. Vrijednosti opterećenja snijega su veće u odnosu na razdoblje prije definisanja karte opterećenja u 2018. godini, što je izazvalo određene sumnje projektanata. Ovaj je rad pokazao da su dodijeljene vrijednosti karakterističnog opterećenja snijega realne i primjenjive za projektovanje konstrukcija.

Ključne riječi: *karakteristično opterećenje snijegom, karta opterećenja snijega, istočni dio Bosne i Hercegovine*

INFLUENCE OF WIND LOAD TO THE BILLBOARDS AT MOSTAR VALLEY

UTICAJ OPTEREĆENJA VJETRA NA REKLAMNE PANELE U MOSTARSKOJ KOTLINI

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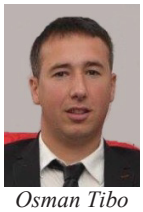
[2]Babić doo Jablanica

Rašid Hadžović Osman Tibo

ABSTRACT:
The aim of this paper is to analyze the wind load in the Mostarvalley since wind speeds are up to 240 km/h. The values of bending and resistance moments relative to the surface of the billboardswere calculated and the necessary equations were obtained. For 9 different cases of size of billboards, the values of the bending moments and resistance moments over to increasing wind speed were calculated and equations were obtained describing the coefficients “a” and “c” needed to calculate Mmax and Wpot. Finally, two examples were made as evidence of the analysis.

Keywords: *billboards,wind speed, wind load, bending moment, resistance moment,Mostar valley*

SAŽETAK:
Cilj ovog rada je analiza opterećenja vjetra na području mostarske kotline s obzirom da brzine vjetra budu i do 240 km/h. Proračunate su vrijednosti momenata savijanja i momenta otpora u odnosu na površinu reklamnih panela i dobivene su potrebne jednačine. Za 9 različitih slučaja reklamnih panoa su proračnate vrijednosti momenata savijanja momenta otpora za povećanje brzine vjetra i dobivene su jednačine koje opisuju koeficijente “a” i “c” potrebne za proračun Mmax i Wpot. Na kraju su urađena dva primjera kao dokaz urađene analize.

Ključne riječi: *reklamni paneli,brzina vjetra, opterećenje vjetrom, moment savijanja, moment otpora,mostarska kotlina*

PRESENTATIONAL ADVANCES IN USER-BASED DESIGN PROCESSES IN ARCHITECTURE AND CIVIL ENGINEERING: VIRTUAL REALITY DIMENSION

PREZENTACIJSKE MOGUĆNOSTI U KORISNIČKI ORIJENTISANOM PROJEKTOVANJU U ARHITEKTURI I GRAĐEVINARSTVU: DIMENZIJA VIRTUELNE REALNOSTI

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Amer Alić *Adnan Novalić* *Maja Popovac* *Ahmed El Sayed*

ABSTRACT:
Virtual Reality has been acquired in certain fields where the interaction is important such as the Architectural-Engineering-Construction field. This paper aimed to investigate the impact of using Virtual reality in Designing Process on improving the communication between Designers and Users. Using Qualitative research methodology, the findings agree that the major disadvantage is difficult software workflow for specific industries. It has been concluded that the increased interest in VR and immersive environments is allowing better understanding and identification of problems andis offering more accurate visualization and better project communication.

Keywords: *Virtual Reality, Virtual World, Visualization, Architectural and Civil Design*

SAŽETAK:
Dimenzija virtuelne stvarnosti stvorila je priliku za korisnike i investitore da dožive projektovane prostore i kao takva se koristi u Arhitektonsko-građevinska industrija. Ovaj rad je istražio ulogu korištenja VR u procesu dizajniranja i u poboljšanju komunikacije između dizajnera i korisnika. Kvalitativnom metodologijomutvrđeno je da je glavni nedostatak težak softverski tijek rada za određene industrije. Zaključeno je da povećano zanimanje za VR i imerzivna okruženja omogućava bolje razumijevanje i identificiranje problemai nudi precizniju vizualizaciju sa kojom je moguće uspostaviti relevantniju komunikaciju projekta.

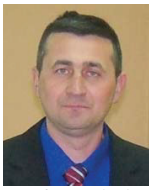
Ključne riječi: *Virtuelnarealnost, Virtuelnisvijet, Vizualizacija, Arhitektonsko-građevinsko projektovanje.*

USING THE SEMI-PROFESSIONAL UAV SYSTEM IN SURVEYING THE MEDIUM SIZE AREA OF COMPLEX URBAN SURFACE

KORIŠTENJE POLUPROFESIONALNOG BESPILOTNOG AEROFOTOGRAMETRIJSKOG SISTEMA PRILIKOM SNIMANJA KOMPLEKSNE URBANE POVRŠINE SREDNJE VELIČINE

Jasmin Ćatić, Admir Mulahusić, Nedim Tuno, Jusuf Topoljak
University of Sarajevo, Faculty of Civil Engineering



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ABSTRACT:
The prices of professional unmanned aerial vehicles have become more affordable lately, making UAV photogrammetry more economical than traditional aerial photogrammetry. The process of obtaining the final results – 3D model of captured object, Digital orthophoto, Digital Surface or Terrain model (DSM or DTM), is much easier by using this method. It is also possible to apply this method in the urban environments. Using the semi-professional UAV, a high accurate surface or terrain models and Digital orthophotocould be achieved. Paper presents the use of such UAV (DJI Phantom 4 Pro) for obtaining Digital orthophotoand DSM of the area around the Faculty of Civil Engineering - University of Sarajevo, which is a medium size area of complex urban surface. Achieved 3D accuracy was 7,5 cm.

Keywords: *UAV, DSM, Digital orthophoto, RTK, photogrammetry, Phantom, DJI*

SAŽETAK:
Cijene profesionalnih bespilotnih letjelica u posljednje vrijeme postaju pristupačnije, što UAV fotogrametriju čini ekonomičnijom u odnosu na tradicionalnu aerofotogrametriju. Proces dobivanja konačnih rezultata - 3D modela snimljenih objekata, digitalni ortofoto, digitalni model površine ili digitalni model terena (DSM ili DTM) , mnogo je jednostavniji zahvaljujući ovoj metodi. Također je moguće primijeniti ovu metodu u urbanim sredinama.. Korištenjem poluprofesionalne bespilotne letjelice mogu se kreirati visoko precizni modeli površina ili terena, te digitalni ortofoto. U radu je prikazana upotreba takve bespilotne letjelice (DJI Phantom 4 Pro) za dobivanje Digitalnog ortofota i DSM-a područja oko Građevinskog fakulteta Univerziteta u Sarajevu, što je područje srednje veličine složene urbane strukture. Postignuta 3D tačnost je 7,5 cm

Ključne riječi: *UAV, DSM, Digitalni ortofoto, RTK, fotogrametrija,, Phantom, DJI*

THE USE OF GREEN MATERIALS IN ARCHITECTURAL & CIVIL DESIGN AND THE SUCCESS OF CONSTRUCTION PROJECTS: CASE STUDY OF BOSNIA AND HERZEGOVINA

KORIŠTENJE ZELENIH MATERIJALA U ARHITEKTONSKOM I GRAĐEVISKOM PROJEKTOVANJU I USPJEH GRAĐEVINSKIH PROJEKATA: STUDIJA SLUČAJA BOSNE I HERCEGOVINE

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Yousef Zaarir *Fuad Ćatović* *Adnan Novalić* *Ahmed El Sayed*

ABSTRACT:
This paper focused on determining the effect of the design phase on the construction project success and to investigate the awareness of construction project participants about the values and benefits gained by using green materials and buildings. Results gained by using qualitative research method demonstrated that the design has a significant impact on different phases of the construction project. It has been concluded that the design has a direct effect on the cost, technology, scope, and schedule of the project.

Keywords: *Architectural and Civil Design, Construction Project Management and cost, Construction Project Success, Green materials.*

SAŽETAK:
Osnovni fokus ovog rada predstavlja utvrđivanje utjecaja arhitektonskog-građeviskog projektovanja na uspješnost projekata i da ispita način razmišljanja sudionika u građevinskim projektima po pitanjima koja se tiču vrijednostima i koristima koji se stiču upotrebom zelenih materijala i objekata. Rezultati dobiveni kvalitativnom metodom istraživanja su pokazali da dizajn ima značajan utjecaj na različite faza građevinskog projekta i da projektovanja ima izravan utjecaj na cijenu, tehnologiju, opseg i raspored projekta.

Ključne riječi: *Arhitektonsko-građevinsko projektovanje, upravljanje građevinskim projektima i troškovima, uspjeh građevinskog projekta, Zeleni materijali.*

EVALUATION OF FACTORS AFFECTING THE PROCESS OF DECISION MAKING IN CONSTRUCTION SITE

EVALUACIJA FAKTORA KOJI UTIČU NA PROCES DONOŠENJA ODLUKA NA GRADILIŠTU

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Almedina Mustafić Suad Špago Adnan Novalić Ahmed El Sayed

ABSTRACT:
This paper aimed to explore factors that may have significant impact on the decision-making process for engineering at construction site, to analyze the existing decision-making methods for the construction industry worldwide, to gather the factors affecting the decision-making process at construction site, and to list these factors according to their impact and frequency of occurring. Results gained by using qualitative research methods proved that Construction site layout planning, supplier selection process, and materials management practices at the site are the most frequent factors influencing the decision-making process at the site.

Keywords: *Decision-making process, effective models, construction site, project management, Decision-making support system, layout planning, materials management.*

SAŽETAK:
Ovaj rad ima za cilj da istraži faktore koji mogu imati značajan uticaj na proces donošenja odluka koji se tiču inženjeringa na gradilištu, analizira postojeće metode donošenja odluka za građevinarstvo u cijelom svijetu, prikupi činjenice koje utječu na proces donošenja odluka na gradilištu, te da da popis tih faktora u skladu s njihovim utjecajem i učestalošću nastajanja. Rezultati dobiveni korištenjem kvalitativne metode istraživanja potvrđuju da su planiranje izgleda gradilišta, postupak odabira dobavljača i postupci upravljanja materijalima na gradilištu najčešći faktori koji utječu na proces donošenja odluka na gradilištu.

Ključneriječi: *Procesi donošenja odluka, efikasni modeli, gradilište, upravljanje projektima, sistem podrške za donošenje odluka, planiranje osnova, upravljanje materijalima*

TECHNO-ENTREPRENEURSHIP: INTERDISCIPLINARY CURRICULA CHALLENGES FOR 4IR IN BOSNIA AND HERZEGOVINA

TEHNO-PREDUZETNIŠTVO: INTERDISCIPLINARNI IZAZOVI ZA KURIKULUME U SUSRET 4IR U BOSNI I HERCEGOVINI

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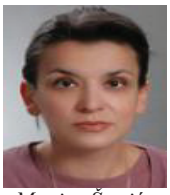
Munira Šestić


Elvir Čizmić


Mirha Bičo Ćar


Dženana Hodžić

ABSTRACT:
Techno-entrepreneurship includes both entrepreneurial and intrapreneurial activities in which entrepreneur recognises ideas related to innovation and technology development, finding ways to its market implementation and verification in technology-intensive environments. In this article we analyse the presence of the subject of Techno-entrepreneurship in Economic and Non-economic studies at the universities of Bosnia and Herzegovina and widely suggest guidelines and recommendations for creating its interdisciplinary curricula for the aforementioned studies following contemporary world academic practices. The aim is to domesticate the term of techno-entrepreneurship in the educational offer of the universities in Bosnia and Herzegovina, responding to the demands of modern educational requirements and rhythms brought by the Fourth Industrial Revolution.

Keywords: *Techno-entrepreneurship, the Fourth Industrial Revolution, curricula, interdisciplinarity, Bosnia and Herzegovina*

SAŽETAK:
Tehno-preduzetništvo obuhvata i preduzetničke i intra-preduzetničke aktivnosti u kojima preduzetnik prepoznaje ideje vezane za inovacije i razvoj tehnologije, pronalazeći načine za njihovu primjenu na tržištu i tržišnu verifikaciju u tehnološki intenzivnim okruženjima. U ovom članku analiziramo prisutnost predmeta tehno-preduzetništvo na ekonomskim i neekonomskim studijama na univerzitetima u Bosni i Hercegovini, te predlažemo smjernice i preporuke za izradu interdisciplinarnih kurikuluma tehno-preduzetništva za gore spomenute studije, prateći savremenu svjetsku akademsku praksu. Cilj je „udomaćiti“ pojam tehno-preduzetništva u obrazovnoj ponudi univerziteta u Bosni i Hercegovini, odgovarajući time na zahtjeve modernih obrazovnih potreba i ritmova koje donosi Četvrta industrijska revolucija.

Ključne riječi: *tehno-preduzetništvo, Četvrta industrijska revolucija, kurikulumi/nastavni programi, interdisciplinarnost, Bosna i Hercegovina*

MECHANISM OF STIMULATE THE GROWTH OF HIGHLY COMPETITIVE TECHNOLOGY BUSINESS

MEHANIZAM STIMULATIVNOG RASTA POSLOVANJA VISOKO KONKURENTNE TEHNOLOGIJE

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[2]Belgorod University of Cooperation, Economics and Law, Belgorod, Russia




Y. A. Doroshenko *L. A. Minaeva* *I. V. Somina* *N. N. Glagoleva*

ABSTRACT:
The article discusses the methodological approaches to the definition of the concepts of "high-tech business", "high technology", "information technology" and others. The main components of a highly competitive technological business are revealed: high technology, science output, and the share of people employed in R & D. The influence of investments in human capital on the development of high-tech business is shown. The main problems were revealed: the lack of highly qualified personnel and insufficient motivation of employees, lack of activity in the implementation of information technologies in production processes; insufficient efficiency of implementation of state programs in the field of science and innovations, etc. Recommendations are given to stimulate the growth of a highly competitive technology business.

Keywords: *information technology (IT), high technology, highly competitive technological, highly competitive technological business.*

SAŽETAK:
U članku se razmatraju metodološki pristupi definisanju pojmova „visokotehnološko poslovanje“, „visoka tehnologija“, „informaciona tehnologija“ i drugi. Otkrivene su glavne komponente visoko konkurentnog tehnološkog poslovanja: visoka tehnologija, naučni rezultati i udeo ljudi zaposlenih u istraživanju i razvoju. Prikazan je uticaj ulaganja u ljudski kapital na razvoj visoko-tehnološkog poslovanja. Otkriveni su glavni problemi: nedostatak visoko kvalifikovanog kadra i nedovoljna motivacija zaposlenih, nedostatak aktivnosti na primeni informacionih tehnologija u proizvodnim procesima; nedovoljna efikasnost primene državnih programa u oblasti nauke i inovacija itd. Daju se preporuke za podsticanje rasta visoko konkurentnog tehnološkog poslovanja.

Ključne riječi: *informaciona tehnologija (IT), visoka tehnologija, visoko konkurentna tehnologija, visoko konkurentno tehnološko poslovanje.*

METHODOLOGY OF THE FORMATION OF A COMPREHENSIVE SUPPORT MECHANISM OF INNOVATION AND INVESTMENT DEVELOPMENT IN THE REGION

METODOLOGIJA FORMIRANJA MEHANIZMA SVEOBUHVATNE PODRŠKE ZA RAZVOJ INOVACIJA I INVESTICIJA U REGIONU

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Y.A. Doroshenko *I. O. Malykhina* *I. V. Somina*

ABSTRACT:
Nowadays the situation of the national economy is characterized by the need to carry out significant, and in some industries - radical modernization processes, management reform, the formation of new economic relations based on innovation. Problems of perspective development of regions as subjects of the national economy, as well as diversification structuring of regional economies, require the formation of an integrated mechanism to support the impulses of their development. At the present time the traditional factors of economic growth of the Russian economy are almost completely exhausted. In this regard, the problem of finding new sources of development of domestic economic systems at all levels is particularly relevant. However, the key condition for the successful development of Russia in the long term is the modernization of all sectors of the economy, especially the industrial sector, which cannot be done without actively applying the results of innovation. ....
Keywords: *national economy, economic growth, innovation and investment development, modernization processes.*

SAŽETAK:
Danas se stanje nacionalne ekonomije karakteriše potrebom da se sprovedu značajni, a u nekim industrijama - radikalni modernizacioni procesi, reforma upravljanja, formiranje novih ekonomskih odnosa zasnovanih na inovacijama. Problemi perspektivnog razvoja regiona kao subjekata nacionalne ekonomije, kao i diverzifikaciona struktura regionalnih ekonomija, zahtevaju formiranje integrisanog mehanizma koji će podržati impulse njihovog razvoja. Trenutno su tradicionalni faktori ekonomskog rasta Ruske ekonomije gotovo u potpunosti iscrpljeni. S tim u vezi, problem pronalaženja novih izvora razvoja domaćih ekonomskih sistema na svim nivoima je posebno relevantan. Međutim, ključni uslov za uspešan razvoj Rusije na duži rok je modernizacija svih sektora ekonomije, posebno industrijskog, što se ne može postići bez aktivne primene rezultata inovacija. ....
Ključne riječi: *nacionalna ekonomija, ekonomski rast, razvoj inovacija i investicija, procesi modernizacije.*

GLOBAL GENDER GAP INDEX: IS IT TIME TO MEASURE TECHNOLOGY ACCESS GAP ALSO?

GLOBALNIINDEX RODNOG JAZA: DA LI JE VRIJEME ZA MJERENJE JAZA I U PRISTUPU TEHNOLOGIJI?

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ABSTRACT:
The Gender Gap Index was introduced by the World Economic Forum (WEF) in 2006 as "A framework for capturing the magnitude of gender-based disparities and tracking their progress over time"based on the idea that the equal contribution of women and men is critical for societal and economic development. The question of technology access gap arises in the form of horizontal segregation not only in terms of choosing the field of education and job participation, but also in disparities in the use and application of new technologies and the choice of dominant business field when starting a business. Technology access is essential in order to take full advantage of new technologies and therefore gender-based disparity in this area is important to measure and track, for both academic researchers and policy makers.

Keywords:*World Economic Forum, Gender Gap Index, context of the Fourth Industrial Revolution*

SAŽETAK:
Indeks rodnog jaza uveden je od strane Svjetskog ekonomskog foruma (WEF) 2006. godine kao "okvir za uočavanje veličina nejednakosti na temelju spola i praćenje njihovog napretka tokom vremena" iutemeljen je na ideji da je jednak doprinos žena i muškaraca nužan za društveni i ekonomski razvoj. Pitanje jaza u pristupu tehnologiji postavlja se u obliku horizontalne segregacije, ne samo u smislu odabira područja obrazovanja i profesija, već i u nejednakosti u korištenju i primjeni novih tehnologija i izboru dominantne poslovne djelatnosti prilikom pokretanja posla. Pristup tehnologiji je ključan kako bi se u potpunosti iskoristile nove tehnologije i zbog toga je razlika koja se temelji na spolu u ovom području važna za mjerenje i praćenje, kako za akademske istraživače, tako i za donositelje politika.

Ključne riječi: *Svjetski ekonomski forum, Indeks rodnogjaza, kontekst četvrte industrijske revolucije*

STATISTICAL ANALYSIS OF E-GOVERNMENT DEVELOPMENT INDEX (EGDI) OF GEORGIA

STATISTIČKA ANALIZA INDEKSA RAZVOJA E-VLADE (EGDI) GRUZIJE

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ABSTRACT:
EGDI (e-Government Development Index) is used for measure the development of e-Gov in different regions and countries at the national level. The EGDI is a composite index based on the weighted average of following three indices: online service index (OSI), telecommunications infrastructure index (TII) and human capital index (HCI). The EGDI index is based on data collected and publication of United Nations E-Government Survey (UN-EGS) and analyzes the ranking of the 193 UN member states, from 2003. In the paper is given statistical and trend analysis of Georgia's EGDI index for the period 2003-2018. Based on statistical and trend analysis, the EGDI index in Georgia for the period 2003-2018 had an increase from 96.33% (CGI=196.33 and CAGR=4.60% per year in 2018 compared to 2003). ....

Keywords: *Development indices (DI), e-government development index (EGDI), online service index (OSI), telecommunications infrastructure index (TII), human capital index (HCI).*

SAŽETAK:
EGDI (indeks razvoja e-vlade) se koristi za merenje razvoja e-vlade u različitim regionima i zemljama na nacionalnom nivou. EGDI je složeni indeks zasnovan na ponderisanom proseku sledeća tri indeksa: indeks online usluga (OSI), indeks telekomunikacione infrastrukture (TII) i indeks ljudskog kapitala (HCI). EGDI indeks zasnovan je na prikupljenim podacima i objavljivanju Ankete o e-vladi Ujedinjenih nacija (UN-EGS) i analizira rangiranje 193 države članice UN, počev od 2003. godine. U radu je data statistička analiza i analiza trenda Gruzijskog EGDI indeksa za period 2003-2018. Na osnovu statističke analize i analize trenda, indeks EGDI u Gruziji za period 2003-2018 porastao je za 96,33% (CGI=196.33 i CAGR = 4,60% godišnje u 2018. godini u odnosu na 2003. godinu). ...

Ključne riječi: *Indeksi razvoja (DI), indeks razvoja e-vlade (EGDI), indeks online usluga (OSI), indeks telekomunikacione infrastrukture (TII), indeks ljudskog kapitala (HCI).*

VALORIZATION OF MONTENEGRIN LIGHTHOUHES AS DESTINATION ICONS THROUGH DIFFERENT FORMS OF MULTIMEDIA ARTS

PRIMJENA MULTIMEDIJALNE UMJETNOSTI UVALORIZACIJI CRNOGORSKIH SVETIONIKA KAO DESTINACIJSKIH IKONA

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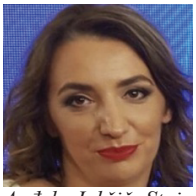


Anđela Jakšič- Stojanović *Neven Šerić*

ABSTRACT:
There are more than forty-five lighthousesin Montenegro and some of them have significant importance from historical, cultural or some other point of view. But, unfortunately, they are not registered as cultural and historical monuments, nor protected by law, so their fate in the era of modernization, globalization, rapid foreign investments etc. is quite uncertain. Because of that, it is necessary to create completely new marketing-management approach which is based on adequate preservation, protection, valorization and promotion of lighthouse heritage.Proposed concept is based on the usage of different forms of multimedia arts andICT which represents completely new approach in promotion of this segment of cultural heritage- not only in Montenegro, but in the world as well.

Keywords:*lighthouses, contemporary art, ICT technologies, tourism, valorization*

SAŽETAK:
U Crnoj Gori postoji preko četrdeset pet svetionika, a neki od njih imaju izuzetan značaj sa istorijskog, kulturnog ili nekog drugog aspekta. Ali, nažalost, oni na nacionalnom nivou nijesu registrovani kao kulturni i istorijski spomenici, a samim tim ni zaštićeni zakonom, tako da je njihova sudbina u doba modernizacije, globalizacije, intenzivnih stranih investicija i sl. neizvjesna. Upravo iz tog razloga, neophodno je osmisliti i kreirati potpuno novi marketing-menadžment pristup koji će biti zasnovan na adekvatnom očuvanju, zaštiti, valorizaciji i promociji svetioničkog fonda. Koncept koji je predložen u ovom radu se zasniva na primjeni različitih formi multimedijalne umjetnosti i savremenih informacionih tehnologija što predstavlja jedan potpuno novi pristup u promociji ovog segmenta kulturne baštine ne samo u Crnoj Gori, već i u svijetu.

Ključne riječi: *svetionici, savremena umjetnost, ICT, turizam,valorizacija*

MEASURING YOUTH ATTITUDES ON MATERIALISM AS A CONSEQUENCES OF A CONSUMER SOCIETY

MJERENJE STAVOVA MLADIH O MATERIJALIZMU KAO POSLJEDICA POTROŠAČKOG DRUŠTVA

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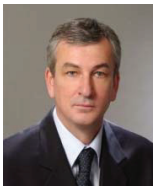


Emir Kurtović Savo Stupar Naida Jažić-Asotić Mirha Bičo Ćar

ABSTRACT:
This paper deals with the analysis of young people's attitudes towards materialism,through its three key dimensions: possession, selfishness and envy. An empirical study was conducted on a sample of 206 respondents, aged 20 to 30 years, with an active residence in the country. The results show that, young people in BiH are not strongly influenced by materialism, which in young people is not related to their life values, i.e. the perception of their value towards important things in life. Age of youth does not increase the propensity for materialistic values, but the increased religiosity of young people leads to a decrease in the propensity for materialism. The paper concludes that materialism, as a kind of social and cultural phenomenon that is leading in shaping the contemporary global image of society, is not a dominant form in Bosnian society and does not affect the behavior of young people.

***Keywords**: youth, materialism, consumerism, values*

SAŽETAK:
Ovaj rad se bavi analizom stavova mladih o materijalizmui njegove tri ključne dimenzije: posjedovanje, sebičnost i zavist. Provedeno je empirijsko istraživanje na uzorku od 206 ispitanika, u starosnoj dobi od 20 do 30 godina, sa aktivnim prebivalištem u zemlji. Rezultati istraživanja pokazuju da, mladi u BiH nisu pod snažnim uticajem materijalizma i da materijalizam kod mladih nije povezan sa njihovim životnim vrijednostima tj. percepcijom njihove vrijednosti prema važnim stvarima u životu. Dob mladih ne utiče na povećanje sklonosti ka materijalističkim vrijednostima, a povećani stepen religioznosti mladih vodi smanjenju sklonosti ka materijalizmu.U radu izvodimo opšti zaključak da materijalizam, kao svojevrsni društveni i kulturološki fenomen koji prednjači u oblikovanju savremene globalne slike o društvu, u bosanskoercegovačkom društvu nije dominantan oblik i da ne utiče na ponašanje mladih.

***Ključne riječi:** mladi, materijalizam, konzumerizam, vrijednosti.*

“WHAT THE ENGINEERS WANT” – JOB EXPECTATIONS OF THE EMPLOYEES IN IT INDUSTRY

„ŠTA INŽINJERI ŽELE“ – OČEKIVANJA ZAPOSLENIH U IT INDUSTRIJI

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Muamer Bezdrob Mirha Bičo Ćar

ABSTRACT:

This research is aimed to analyze worker expectations of the workplace and work environment and explores the difference in job expectations between the technical and non-technical staff within IT industry. The research results show that the main difference between the technical and non-technical staff within the IT industry is related to self-actualization and professional advancement.At the same time, there is no difference between the two groups of employees when it comes to the general characteristics of the work environment and the competitiveness of the job environment. These findings point to individualism as a particular personality trait that makes the difference between technical and non-technical employees in the IT industry.

Keywords:*Job Expectations, Job Environment, IT Industry, Engineers*

SAŽETAK:

Namjena ovog istraživanja je analizirati očekivanja radnika od radnog mjesta i radnog okruženja te istražiti razlike u očekivanjima od posla između tehničkog i netehničkog osoblja u IT industriji. Rezultati istraživanja pokazuju da je glavna razlika između tehničkog i netehničkog osoblja IT industrije povezana sa samorealizacijom i profesionalnim napretkom. Istodobno, ne postoji razlika između dvije skupine zaposlenika kada su u pitanju opće karakteristike radnog okruženja i konkurentnosti radnog okruženja. Ovinalazi ukazuju na individualizam kao posebnu osobinu ličnosti koja pravi razliku između tehničkih i netehničkih zaposlenika u IT industriji.

Ključne riječi: *Očekivanja od posla, radno okruženje, IT industrija, inžinjeri*

RISK MANAGEMENTAS A PART OFTHE BUSINESS PROCESSIN CORPORATE FIRMS

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University of Petrosani–Doctoral School




H. Vochitoiu *F. Vedinas* *O. Miclea* *C. L. Unguras*

ABSTRACT:
Risk management is the process that allows business managers to balance operational and economic costs of protective measures and achieve gains in mission capability by protecting business processes that support the business objectives or mission of the enterprise. Risk management, however, is not restricted to the information technology and security realm. This is a business process that assists management in meeting its fiduciary duty to protect the assets of the organization.

Keywords: *risk, business manager, information security*

1. INTRODUCTION

Risk management is the total process used to identify, control, and minimize the impact of uncertain events. The objective of the risk management program is to reduce the risk of performing some activity or function to an acceptable level and obtain senior management approval. Risk management is made up of four distinct processes: risk analysis, risk assessment, risk mitigation, vulnerability assessment and controls evaluation. Senior management must ensure that the enterprise has the capabilities needed to accomplish its mission or business objectives. However, the senior management of a department, business unit, group, or other such entity is considered to be the *functional owner* of the enterprise′s assets and it is senior management′s fiduciary duty to act in the best interest of the enterprise to implement reasonable and prudent safeguards and controls. Risk management uses the following terms[1-3]:
Risk management–The total cost to identify, control, and minimize the impact of uncertain events. The objective of risk management is to reduce risk to an acceptable level.
Risk analysis–A technique to identify and assess factors that may jeopardize the success of a project or achieving a goal. This technique also helps define preventive measures to reduce the probability of these factors from occurring and identify countermeasures to successfully deal with these constraints when they develop.

THE APPLICATION OF PROMETHEE IN CHOSING THE BEST PROMOTION SERVICE

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Lamija Šćeta


Adela Delalić


Halid Skaka

ABSTRACT:
One of the common problems faced by companies of various types is the choice of the type of promotion that will present their products or services to a targeted group of consumers. Numerous elements influence this choice, some of which are budget, availability, sustainability, visibility, flexibility, innovation. This problem is well suited for the application of multicriteria decision making, and will thus serve as a case study in this paper.The problem discussed in the case study is the selection of a promotion service that is adequate for companies in Sarajevo Canton. The results of this research may be of particular importance to marketing agencies when designing packages of promotion services offered to companies in Bosnia and Herzegovina. The PROMETHEE is very useful and adequate in the multicriteria decisionmaking process in economics and management. For the implementation of this methodwe used the Visual PROMETHEE software tool, which enables a wider and faster application of the method.

Keywords: *Multicriteria decision making, PROMETHEE, promotion services*

SAŽETAK:
Jedan od čestih problema s kojim se susreću kompanije različitog tipa jeste izbor vida promocije kojim će se predstaviti svoje proizvode ili usluge ciljanoj skupini potrošača. Mnogobrojni elementi utiču na taj izbor, neki od njih su budžet, dostupnost, postojanost, rasprostranjenost, fleksibilnost, inovativnost. Ovaj problem je vrlo pogodan za primjenu višekriterijskog odlučivanja, te će poslužiti kao studija slučaja u ovom radu. Problem koji je razmatran u okviru studije slučaja je izbor usluge promocije koja je adekvatna za kompanije na području Kantona Sarajevo. Rezultati ovog istraživanja mogu biti od posebnog značaja agencijama za marketing prilikom dizajniranja paketa usluga promocije koje nude kompanijama na prostoru Bosne i Hercegovine. PROMETHEE metoda se pokazala vrlo korisnom i adekvatnom u procesu višekriterijskog odlučivanja u ekonomiji i menadžmentu. Za implementaciju ove metode koristili smo Visual PROMETHEE software, koji nam omogućava opsežniju i bržu primjenu metode.

Ključne riječi: *Višekriterijsko odlučivanje, PROMETHEE metod, usluge promocije*

NEW TECHNOLOGIES IN THE FINANCIAL INDUSTRY

NOVE TEHNOLOGIJE U FINANSIJSKOJ INDUSTRIJI

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Adem Abdić *Adnan Rovčanin* *Ademir Abdić*

ABSTRACT:
Financial and technological innovations during the last two decades in the financial system were underpinned the emergence of new business models, strategies, processes, products and applications. Further, new entrants into the financial markets and providing financial services changed the dominant operating business models and competitive dynamics of a financial industry. The main purpose of this paper is to explore and analyze evolution of the relationship between finance and technology over the last two centuries. After that, in the paper are identified key drivers of FinTech innovations, are identified key market players and key areas in FinTech. The basic source of data in this paper was the secondary sources provided by other researches those include journal articles, reviews and academic books. The scientific contribution of this paper is reflected in the fact this paper represents one of the pioneering analysis of the FinTech in the B&H. Finally, for further analysis it can be explore the reaction of regulatory bodies on each of the eras of FinTech evolution and on the changes of IT and the nature of financial systems worldwide.
Keywords: *Financial participants, Financial technology, Financial innovation, Financial services, Millennials*

SAŽETAK:
Finansijske i tehnološke inovacije tokom posljednjih dvadesetak godina u finansijskom sistemu potaknule su pojavu novih poslovnih modela, strategija, procesa, proizvoda i aplikacija. Nadalje, novi učesnici na finansijskim tržištima i pružanje financijskih usluga promjenile su dominantne modele poslovanja i dinamiku konkurentnosti finansijske industrije. Glavna svrha rada je istražiti i analizirati evoluciju odnosa između finansija i tehnologije tokom posljednja dva vijeka. Nakon toga su u radu identificirani ključni pokretači FinTech inovacija, identificirani ključni učesnici na tržištu i ključna područja u FinTech-u. Osnovni izvor podataka u radu su sekundarni izvori koji uključuju članke iz časopisa, izvještaja i akademskih udžbenika. Naučni doprinos rada ogleda se u činjenici da ovaj rad predstavlja jednu od pionirskih analiza FinTech-a u BiH. Konačno, za daljnju analizu može se istražiti reakcija regulatornih tijela u svakoj eri evolucije FinTech-a kao i na promjene IT-a i prirode finansijskih sistema širom svijeta.
Ključne riječi: *Učesnici finasijskih tržišta, Finansijska tehnologija, Finansijske inovacije, Finansijske usluge, Milenijska generacija*

STATISTICAL ANALYSIS AND MODELING OF GLOBAL INNOVATION INDEX (GII) OF SERBIA

STATISTIČKA ANALIZA I MODELIRANJE GLOBALNOG INDEKSA INOVACIJA (GII) SRBIJE

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ABSTRACT:
The global innovation index (GII) is an indicator which annual ranking of countries by their capacity and success in innovation and innovative activities and published annually from 2007. According to the GII index, for the observed period 2009-2019, Serbia was in quartile Q2, except in 2009-2010 and 2016 when it was in Q3 and Q4. In the paper is given trend analysis and approximation of Serbia's global innovation index (GII) for period 2011-2019, Data about GII index is adequately approximated with 5th-degree polynomial regression model (PRM5) with $R=0.92085$, $R^2=0.84797$ and $AdjR^2=0.59459$.

Keywords: *Global innovation index (GII), statistical analysis, polynomial regression model (PRM).*

SAŽETAK:
Globalni indeks inovacija (GII) je pokazatelj koji rangira zemlje po njihovom kapacitetu i uspehu u inovacijama i inovativnim aktivnostima i objavljuje se svake godine od 2007. Prema indeksu GII, za posmatrani period 2009-2019, Srbija je bila u kvartalnom Q2, osim u periodu 2009-2010 i 2016, kada je bila u Q3 i Q4. U radu je data analiza trendova i aproksimacija globalnog indeksa inovacije (GII) u Srbiji za period 2011-2019. Podaci o indeksu GII adekvatno su aproksimirani polinomnim regresionim modelom 5. stepena (PRM5) sa $R=0,92085$, $R^2=0,84797$ i $AdjR^2=0.59459$.

Ključne riječi: *Globalni indeks inovacija (GII), statistička analiza, polinomni regresioni model (PRM5).*

MONTENEGRIN DICTIONARY BASED BRUTE FORCE ATTACK

„BRUTE FORCE“ NAPAD BAZIRAN NA CRNOGORSKOM RJEČNIKU

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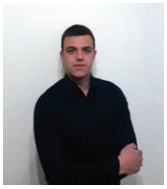
M. Djukanovic


L. Novicevic


M. Jovanovic

ABSTRACT:
Cyber-attacks and cyber-crimes are growing quickly while users are becoming unsafe on the internet. For that reason statistical analysis have been done in order to determine how strong passwords are in the area of Montenegro, and to determine if there is a way to crack them by using brute force attack. Brute force attack or attack by "force" is based on cracking the password with all possible combinations, including cracking Wi-Fi routers, social media account, e-mails, hashes, zip or pdf files protected by password, internet protocols (telnet, ftp, http, https, smb.) etc. We will explain brute force attack for cracking passwords based on statistical analysis data in Montenegro.

Keywords: *Brute force attack, cyber security, password cracking, password security, dictionary attack.*

SAŽETAK:
Sajber napadi i sajber zločini ubrzano rastudok korisnici postaju nezaštićeni na internetu.. Iz tog razloga urađene su statističke analize kako bi se determinisalo koliko su jake šifre na prostoru Crne Gore, ali i kako bi se definisalo da li postoji način da se krekuju uz pomoć napada „brute force“. „Brute force“ napad ili napad silom je baziran na krekovanju šifre uz sve moguće kombinacije, uključujući krekovanje Wi-Fi rutera, naloga socijalnih mreža, imejlova, hešova, zip ili pdf fajlova koji su zaštićeni šifrom, internet protokolima (telnet, ftp, http, https, smb.) itd. Objasnićemo „brute force“ napad za krekovanje šifri baziran na statističkim podacima u Crnoj Gori.

Ključne riječi: *„Brute force“ napad,sajber sigurnost, sajber krekovanje, sigurnost šifre, napad baziran na rječniku.*

A TWO-STAGE MULTI CRITERIA DECISION MAKING IN CROP-LIVESTOCK FARMING

DVOFAZNO VIŠEKRITERIJUMSKO ODLUČIVANJE U MJEŠOVITOJ RATARSKO-STOČARSKOJ PROIZVODNJI

Grujica Vico[1], Radomir Bodiroga[1], Savo Stupar[2]
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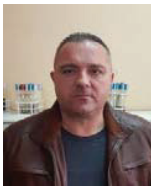
Grujica Vico


Radomir Bodiroga


Savo Stupar

ABSTRACT:
Decision making process is one of the key stage for the successful farm management. In the recent period, the problems are more complex with new issues, which are coming from the climate change, sustainability, circular agriculture, etc. This research aims to show two-stage approach to solving decision making problem in mixed crop-livestock farming. In the first stage, the problem can be treated as well structured problem under strong constraints, and then it could be solved as MADM problem in the second stage. Linear programming (LP) used in the first stage to solve four LP solutions respecting four objectives. In the second phase, two new criteria were set up, and then the new multi-attribute decision making (MADM) problem created and solved by TOPSIS method. The results show that combining two different decision making methods can help farm managers to solve complex problems respecting a numerous both quantitative and qualitative criteria.
Keywords: *linear programming; optimization; TOPSIS, model*

SAŽETAK:
Odlučivanje je jedna od ključnih faza za uspješno upravljanje farmom. U posljednje vrijeme problemi u upravljanju farmama su sve više kompleksniji, sa novim pitanjima koje nameću klimatske promjene, održivost, cirkularna poljoprivreda itd. Ovo istraživanje ima za cilj prikazati dvofazni pristup pri rješavanju problema odlučivanja u mješovitoj ratarsko-stočarskoj proizvodnji. U prvoj fazi problem se može tretirati kao dobro strukjtuiran problem sa dobro definisanim ograničenjima, da bi, nakon toga, u drugoj fazi, problem bio rješavan kao višekriterijumski problem. Linearno programiranje (LP) je korišćeno u prvoj fazi za rješavanje četiri LP modela sa četiri definisana cilja. U drugoj fazi, dodavanjem dva nova kriterijuma, kreiran je problem višeatributivnog odlučivanja (VAO) i isti je rješavan pomoću TOPSIS metode. Rezultati pokazuju da kombinovanje dvije različite metode odlučivanja mogu pomoći menadžeru farme u rješavanju kompleksnih problema respektujući više kvantitativnih i kvalitativnih kriterijuma.
Ključne riječi*: Linearno programiranje, optimizacija, TOPSIS, model*

Autors Index – Indeks autora

SOCIETY FOR ROBOTICS OF BOSNIA AND HERZEGOVINA

The Society for Robotics has years of experience in education and training of personnel in Bosnia and Herzegovina. The Society for Robotics is working to increase the role of knowledge in Bosnia and Herzegovina, and thus to influence the positioning of Bosnia and Herzegovina as high as possible on an innovative scale in Europe and the world. The role of the Society for Robotics is to encourage the development of science and technology, as well as to increase their contribution to the development of society, with the widest possible application of new knowledge and new technologies. Thus, it aims to encourage the transformation of Bosnian-Herzegovinian society into a modern knowledge-based society. For these reasons, the objectives of the Society for Robotics are: scientific and technical research in the field of robotics and robotic systems; education and improvement of education in robotics, robotic systems and mechatronics; application of robots and robotic systems in the industry; establishment of laboratories for education and knowledge transfer; establishment of centers for robotics and robotic systems at universities, secondary and vocational schools; innovators in the wider field of robotic systems conducting various activities; organizing scientific and professional conferences in the country and abroad; having innovators in the field of robotics, robotic systems and mechatronics organize exhibitions; cooperation with similar societies abroad. Activities of the Society for Robotics are the following: gathering scientists, researchers, engineers, teachers and students who work in all areas of robotics; publishing and encouraging the publication of monographs, textbooks, journals and other publications in the field of robotics; helping teachers to introduce new ideas and modern methods in teaching robotics; organizing congresses, conferences, symposia, seminars, and other scientific meetings of scientists and engineers; cooperation with similar professional organizations in the country, international societies and associations; popularization and dissemination of knowledge, as well as training and assistance in the training of scientific novices and researchers.

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Prof.Isak Karabegović, PhD.

DRUŠTVO ZA ROBOTIKU U BOSNI I HERCEGOVINI

Društvo za robotiku ima višegodišnje iskustvo u edukaciji i obrazovanju kadrova u Bosni i Hercegovini. Društvo za robotiku radi na tome da poveća ulogu znanja u Bosni i Hercegovini, a samim tim da utiče na pozicioniranje Bosne I Hercegovine na što više mjesto na inovativnoj skali u Evropi i svijetu. Uloga Društva za robotiku je da postiče razvoj nauke i tehnologije , te poveća njihov doprinos razvoju društva, uz najveću moguću primjenu novih znanja i novih tehnologija, i da na taj način podstakne transformaciju bosanskohercegovačkog društva u moderno društvo temeljno na znanju. Zbog navedenih razloga ciljevi Društva za robotiku su slijedeći: naučno-stručna istraživanja u oblasti robotike i robotskih sistema, edukacija i unapređenje obrazovanja iz robotike, robotskih sistema i mehatronike, aplikacija robota i robotskih sistema u industriji, formiranje laboratorija za edukaciju i transfer znanja, formiranje centara za robotiku i robotskih sistema na univerzitetima, srednjim i stručnim školama, održavanje aktivnosti inovatora iz šire oblasti robotskih sistema, organiziranje naučno-stručnih skupova u zemlji i inostranstvu, organiziranje izložbi inovatora iz oblasti robotike, robotskih sistema i mehatronike, saradnja sa sličnim društvima u inozemstvu. Djelatnosti Društva za robotiku su slijedeće: okupljanje naučnika, istraživača, inženjera, nastavnika, studenata i učenika koji rade u svim područjima robotike, objavljivanje i poticanje objavljivanja monografija, udžbenika, časopisa i ostalih publikacija u području robotike, pomaganje nastavnicima u uvođenju novih ideja i modernih metoda u nastavi robotike, organiziranje kongresa, konferencija, simpozijuma i seminara te ostalih naučnih okupljanja naučnika i inženjera, surađivanje sa sličnim stručnim organizacijama u zemlji, surađivanje sa sličnim međunarodnim društvima i savezima društva, populariziranje i širenje znanja kao i izobrazba i pomoć u izobrazbi znanstvenih novaka i istraživača.

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Nacionalni park Una bosanskohercegovačka i svjetska prirodna vrijednost

Štrbački buk, najviši vodopad na rijeci Unu i najposjećenija atrakcija u Parku

Martinbrodski slapovi, prostorno najveći kompleks slapova u Parku, nominirani su za uvrštavanje na Listu svjetske baštine UNESCO-a

Sportsko rekreativne aktivnosti

Stari grad Ostrovica

Fauna Nacionalnog parka Una

Kanjon Unca


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