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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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TEHNOLOŠKI PARK “INTERA” U MOSTARU

NEW TECHNOLOGIES - DEVELOPMENT AND APPLICATION „NT-2021“

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, 21th May 2021 *THE ORGANIZERS*

NOVE TEHNOLOGIJE - RAZVOJ I PRIMJENA „NT-2021“

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, 21. maj, 2021.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, 21th May 2021 *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, 21. maj, 2021.god. *ORGANIZATORI*

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ABSTRACTS / SAŽETCI
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„NOVE TEHNOLOGIJE, RAZVOJ I PRIMJENA“
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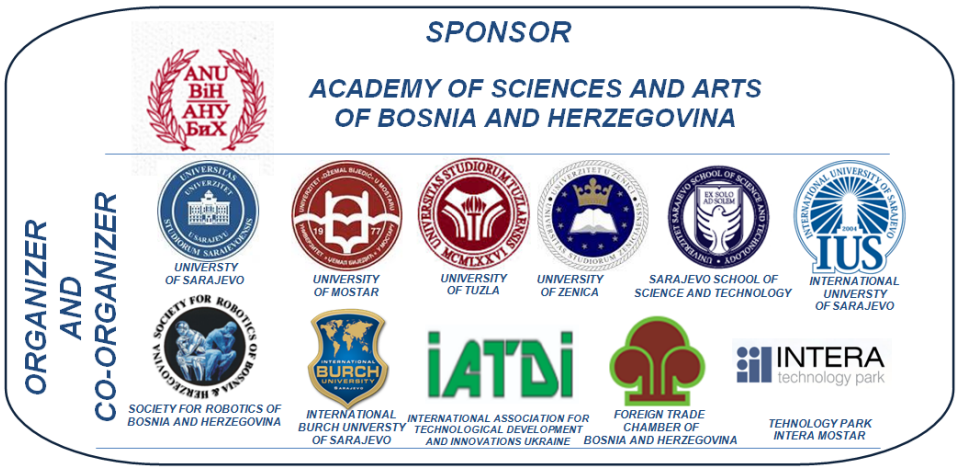

PLENARY SESSION

7th International Conference

"New Technologies, Development and Application“ NT-2021

Sarajevo, 24 th - 26 th June 2021
ACADEMY OF SCIENCES AND ARTS
OF BOSNIA AND HERZEGOVINA

Prof. Nabil Aouf, PhD
Professor of Robotics and Autonomous Systems,
Director of Systems, Autonomy and Control (SAC) Centre,
co-Director of London Space Institute (LSI),
Department of Electrical and Electronic Engineering,
City University of London,
London,
UNITED KINGDOM

Topic: “VISION BASED LOCALISATION FOR AUTONOMOUS VEHICLES”

Biography:

Professor Nabil Aouf Holds a PhD (2002) on Robust Control for Aerospace Vehicles from the Department of Electrical and Computer Engineering, McGill University, Montreal, QC, Canada. From January 2019, Nabil Joined City University of London as Professor of Robotics and Autonomous Systems. He leads the Robotics and Autonomous Vehicles capability and activities at City University of London. He has been a scientist for National Research Council Canada from 2002 to 2005 and he also was an Adjunct Assistant Professor with Concordia University,Canada.He joined Cranfield University at School of Defence and Security as a Lecturer from January 2006 – 2010, then a Senior Lecturer from 2010 – 2013, then a Reader from 2013 and then became a full Professor of Autonomous Systems from 2016 to December 2018. Nabil Aouf built up, and led the Signal and Autonomy group at Cranfield University, Defence and Security (CDS), Defence Academy, Shrivenham, UK. He grew the group from 2 members to include up to 12 staff members. The group was one of the most of the research groups at Cranfield University including more than 20 fully funded PhD students at one moment in time. He contributed to the development of Cranfield University, his group and the school he was belonging to by securing industrial and governmental funding of more than £7.5M during his posts at Cranfield University. He was also the Research Lead of the Centre of Electronic Warfare, Information and Cyber including up to 40 staff members and he was a founding member of the CDS Research Forum which is defining CDS research strategy. He successfully graduated more than 18 PhD students at the national and international level.

Prof. Viktorio Malisa, PhD
Volunteer, Präsident des Vereins,
F-AR Förderung der Automation und Robotik Wien,
Wien,
AUSTRIA

Topic: “PREVENTION MEASURES IN INDUSTRY 4.0 CONSIDERING THE LIMITS OF DIGITALIZATION”

Biography:

Viktorio Malisa is, in addition to being the expert body for Industry 4.0 at AUVA, also the managing director of Centauro GmbH and a lecturer at various universities of applied sciences. Before founding Centauro GmbH, he was the initiator and head of the Mechatronics/Robotics course and head of the Institute for Mechatronics at the University of Applied Sciences Technikum Wien for 10 years. His scientific activities focused on industrial robotics and self-organizing production.

After graduating in mechanical engineering, he worked in industry for more than 20 years, carrying out international projects in the field of automation technology. He has published his practical experience in the books published by Hanser Verlag: "Robotics - Assembly - Handling" and "Fundamentals of Handling Technology, 5th edition".

Viktorio Malisa is also founder and president of the Association for the Promotion of Automation and Robotics (F-AR), co-founder of the Mechatronics Platform Austria and member of the Scientific Advisory Board of VFAALE.

Pajazit Avdović, PhD
Siemens Energy AB Sweden,
Innovation Manager for Additive Manufacturing,
Senior Key Expert in Manufacturing,
SWEDEN

Topic: “iCDby3D” INTELLIGENT COMPONENT DEVELOPMENT FOR GAS TURBINE BY USING 3D PRINTING AT SIEMENS ENERGY AB SWEDEN”

Biography:

Pajazit Avdovic is a Senior Key Expert in Manufacturing at Siemens Energy AB Sweden.He is a mechanical engineer, graduated in Serbia. Year 2011Pajazit took his scientific degree Doctor of Philosophy of Engineering at the Lund University-Sweden in area Cutting technology.He gained his 32-year professional experiences in international organisations such as Zastava, Serbia and currently Siemens Energy, Sweden.Today Pajazit possess a wide network of cooperation with many Swedish Universities, Research Institutes, and companies in the area off Additive Manufacturing.

He is author and co-author for several published articles. Owner of several patents in Subtractive and Additive Manufacturing. He is chairman for yearly conference “Additive Next” and part of thesteering committee for some Additive Manufacturing related Forums in Sweden. He is representant from Siemens Energy AB Sweden in EU funded project “Manuela”.

In 2017 Dr Avdovic was Project Manager for the project “PERUN- Nuclear Power Plant replacement part” which was “HIGHLY COMMENDED” for the Industrial Product Design TCT Award 2017.

Domenico Guida, Ph.D.
Full Professor of Machine Dynamics,
Department of Industrial Engineering,
University of Salerno,
ITALIA

Topic: “ROBOTIC ARMS FOR SATELLITES”

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).

Prof. Sadko Mandžuka, PhD
Intelligent Transport System Department,
Faculty of Traffic and Transport Sciences,
University of Zagreb,
Zagreb,
CROATIA

Topic: “PROVIDING MULTIMODAL TRAVELER INFORMATION – CROSS-BORDER JOURNEY PLANNERS APPROACH”

Biography:

Prof. SadkoMandžuka is a professor at the Faculty of Traffic and Transport Sciences, University of Zagreb. He received BSc Eng. (1980), MSc. (1992), and Ph.D. (2003) degrees in automatic control from the Faculty of Electrical Engineering, University of Zagreb. Prof. Mandžuka is currently Head of Intelligent Transport System Department. He has wide experience in the area of Intelligent Transport System, Traffic modeling, Floating vessels control, hydro-technical systems control, etc. He had the opportunity to work both in academic and industrial environments including “Brodarski Institute Ltd”, consulting in the Innovation Area for SME’s, etc. He was a project leader and collaborating member of several EU and national Research & Development projects. Prof. Mandžuka is president of ITS Croatia, associate member of Croatian Academy of Engineering, member of Scientific Council for Traffic - Croatian Academy of Sciences and Arts, Founding member of Croatian Robotic Association, member of IFAC Technical Committee on Transportation and Vehicle Systems, member of IEEE Intelligent Transportation Systems Society, etc. He is Engineering Applications Section Editor of the international scientific journal “An International Journal of Control and Optimization: Theories & Applications (IJOCTA)”. Also, he is a member of the editorial board of international scientific journal International Journal of Intelligent Transportation Systems Research (Springer) and the national journal “Ceste i mostovi (Roads and Bridges)”. Finally, he has served in the program committees and as reviewer at several international congress and conferences. He is author of more than 100 internationally reviewed publications.

CONTENTS – SADRŽAJ

ON MEASURING VELOCITY AND TEMPERATURE IN LEAKAGE FLOWS OF OIL FREE ROTARY POSITIVE DISPLACEMENT MACHINES

O MJERENJU BRZINE I TEMPERATURE TOKA U ZAZORIMA SUHORADNIH ROTACIONIH VOLUMETRIJSKIH MASINA

Brijeshkumar Patel[1], Ahmed Kovacevic[1], Aleksander Krupa[1]
[1]City, University of London,
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B. Patel


A. Kovacevic


A. Krupa

ABSTRACT:
One of the main unresolved issues affecting reliability and efficiency of rotary oil free positive displacement machines (PDM) is the size of the clearance gaps between the rotating and stationary parts of a machine. This study focuses on developing an experimental setup that can measure the velocity and temperature in the leakage gaps of PDMsat variety of operating conditions. This study is a part of the project “SECRET” (Smart Efficient Compression, Reliability and Energy Targets) supported by The Royal Academy of Engineering (RAEng) and Howden Compressors. The particle image velocimetry (PIV) technique is used for velocity field measurement through a special glass window. Similarly, for measurement of the temperature field, the Planar laser-induced fluorescence (PLIF) technique is selected based on a feasibility study carried out earlier. High-speed infrared thermography is chosen to measure the operational surface temperature of rotary elements.
Results obtained from this setup will provide data for analysis of physics of aerothermal behaviour in clearance flows of PDMs, which will be benchmark case for CFD validation.

Keywords: *Velocity field, Temperature field, Leakage flows, PIV, PLIF, Infrared thermography*

REZIME:
Jedan od neriješenih problema je veličina zazora u volumetrijskim mašinama koja može znacajno uticati na njigovu efikasnonst i pouzdanost. U radu su prikazani instrumenti odabrano za mjerenje brzina i temperatura u zazorima volumetrijskih masina. Ova studija je dio dugoročnog projekta „SECRET“ (Smart Efficient Compression, Reliability and Energy Targets) finansiranog od strane Kraljevske Akademije za Inženjerstvo i kompanije Howden. Tehnika “Particle Immage Velocimetry (PIV) je odabrana za mjerenje brzina fluida.“Planar Laser Induced Fluorescence” (PLIF) se koristi za mjerenje temperature fluida, a “Infrared Thermography” (IT) se koristi za mjerenje temperature rotora u toku rada mašine.
Rezultati eksperimenta koji će se postići iz ovog okruženja obezbijediće podatke za detaljnu analizu strujanja u zazorima i iskoristiće se za verifikaciju podataka dobivenih numerički.

Ključne riječi: *Polje brzina, Polje temperatura, Curenje u zazorima, PIV, PLIF, Infracrvena termografija.*

ATTITUDE CONTROLLER DESIGN FOR MICRO-SATELLITES

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A. Lorusso


D. Guida

ABSTRACT:
The increasing interest of private companies in the aerospace sector has produced a growth of space missions oriented to exploration and colonization. Among the various markets, miniature satellites turns out to be the fastest-growing one. This paper aims to evaluate the control torques needed to ensure the attitude control of a micro-satellite. The orbital mechanics and the motion equations are presented in the first part of the paper. Furthermore, the primary disturbance torques, which act on the satellite varying its attitude and the interaction between the satellite and Earth, will be considered. Thanks to a 3D Solidworks micro-satellite model, several simulations have been conducted in the multibody simulator Simscape. The attitude controller considered for this activity is composed of four reaction wheels. By using a Lagrange multipliers optimization method, a controller based on a PID control system is designed. Such a procedure allows evaluating minimized control torques in order to guarantee several satellite attitudes. The results obtained prove that reaction wheels represent an excellent compromise between reliability and performance at low expense for micro-satellites.

Keywords:*micro-satellite, orbits, attitude control, reaction wheels, multibody*

IMPROVING THE ACCURACY OF MICROHARDNESS MEASUREMENT OF NANOELECTRONIC ELEMENTS BY THE SILICIC PROBES OF ATOMIC-FORCE MICROSCOPY, THAT IS MODIFIED BY CARBON COVERAGE

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M. Bondarenko *V. Antonyuk* *I. Bondarenko* *I. Makarenko* *S. Vysloukh*

ABSTRACT:
Possibility of measuring of microhardness of different surfaces of elements of nanoelec-tronics by means of method of atomic-force microscopy is considered in the article. Possibility of application of silicic probes that is modified by carbon coverage is first shown, that allows to conduct complex researches of surfaces and ultrathin coverages. Dependence of measuring exactness is shown on the microhardness of the investigated material. The range of measuring of microhardness of elements of nanoelectronics is set by such probes. Measuring exactness is megascopic to 20-28%, which is a range from 100 MPa to 39 GPa. It extends the nomenclature of materials at determination of its microhardness by atomic-force microscopy.

Keywords: *atomic-force microscopy, microhardness, nanoelectronics, silicic probe, accuracy*

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1. INTRODUCTION

The nanoindentation method has become more and more popular in recent years due to a decreaseof components size and an increased interest in the mechanical characteristics of elements in the nanometric range [1]. The peculiarity of the manifestation of the mechanical properties of materials at the nanoscale is associated with the manifestation of size effects (the theory of W. Nixon and H. Gao), as well as the possible diversity of the material in phase composition at the nanoscale and a sharp elastic-plastic transition in single crystals of materials (especially metals) [2, 3].

At the same time, methods for measuring the microhardness and elastic properties of materials, as well as thin coatings along the depth of the nanoindentor imprint, are generally recognized in the materials science society.

AN EXPERIMENTAL STUDY OF THE INFLUENCE OF MOUNTING ERRORS ON THE LOAD DISTRIBUTION ALONG THE FACE WIDTH IN A SPUR BEVEL GEAR

Viktor Ivanov[1], Svitlana Ivanova[2], Galyna Urum[2], Dmytro Purich[1]
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V. Ivanov


S. Ivanova


G. Urum


D. Purich

ABSTRACT:
The experiment was carried out on a setup that allows you to change the position of the bevel gear axes. Spur bevel gears were made of Plexiglas. The contact area along the face width of the teeth is determined based on optical measurements with a microscope. The load distribution along the face width based on the contact area of each tooth part is defined. The research was carried out in accordance with the theory of the design of experiments. The combination of mounting errors was set in accordance with the Hartley's experiment plan for forth input factors. The dependence of the load distribution factor on mounting errors has been established.The method of transferring data obtained on Plexiglas models for steel gears is indicated.This method is based on the use of similarity theory.

Keywords: *Plexiglas gear model, spur bevel gears, mounting errors*

---

1. INTRODUCTION

Gear calculations using FEM are widespread.The result of these calculations is the maximum contact and bending stresses.Standard methods for calculating gears use other methods for determining stresses. An integral part of standard calculation methods is the determination of the load distribution factor$k_{H\beta}$. The calculation of the load distribution factor in spur bevel gears in ISO and AGMA standards is not accurate and requires further research [1]. Mounting errors have the greatest effect on the load distribution factor in spur bevel gears.To reduce the sensitivity of the spur bevel train to mounting errors, a crowning contact is usually used [2]. An experimental assessment of the influence of mounting errors on the load distribution factor in spur bevel gears without and with the use of crowning contact was performed in [3].A comparative analysis of the influence of elastic deformations, thermal deformations, manufacturing and mounting errors was carried out using several software packages [4]. In the case of manufacturing bevel gears by plastic deformation, the role of manufacturing errors increases, especially for skew bevel gears [5].

MULTIAXIS MACHINING OF FORK-TYPE PARTS: FIXTURE DESIGN AND NUMERICAL SIMULATION

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I. Dehtiarov


A. Evtuhov


I. Pavlenko


A. Ruban

ABSTRACT:
Assurance of accuracy for machining parts and their work’s reliability is achieved using fixtures with the required accuracy of the locating and the workpiece relia-ble fixing. The expansion of state-of-the-art metal-cutting equipment’s technolog-ical capabilities necessitates using advanced fixture designs to be fully utilized. It requires the application of new approaches and the necessity of advanced fixture design. Fixture design for complex parts machining can reduce the auxiliary time for setup remains especially relevant. A flexible fixture design that provides tool accessibility multiaxis machining of fork-type parts for one setup is proposed. Refusal of full locating, application of industrial robots, and two fixtures for parts machining allows combining auxiliary time with cutting time. The numerical sim-ulation results confirmed that the fixture meets all the strength, accuracy, and stiffness parameters. It allows the application of intensive cutting modes, which will provide the greatest efficiency when using modern machine tools and cutting tools. Oscillation amplitudes in the work surface positions do not exceed these surfaces’ size tolerances.

Keywords: *adjustable fixture, manufacturing process, locating, stiffness, accuracy*

FEATURES OF OVERLOAD PROTECTION FOR BRIDGE TYPE CRANES

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V. Tonkonogyi


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V. Lingur


O. Vudvud

ABSTRACT:
During the bridge cranes operation, overloads may occur when lifting loads whose mass exceeds the cranes' nominal lifting capacity, as well as due to large dynamic loads at starting-up the lifting mechanism and technological operations carrying out. The specificity of bridge cranes overload protection refers to that the method used for this purpose does not provide the necessary accuracy and reliability of protection. Developed is the system of bridge type cranes protection allowing to implement the lifting mechanism translationally moving details separation with simultaneous disconnection of this mechanism criving electric motor. The main idea of such an overload protection system is that the load capacity limiter acts on the lifting mechanism drive when overload in such a way that the drive power circuit load growth rate after the limiter's actuation is zero or below the zero value. To this end, elaborated is a structural diagram of load limiter transmission mechanism that allows the moving parts run-out energy absorption by increasing this mechanism gear ratios at a constant spring rate of load limiter measuring component. The design diagram of the transmission mechanism has been drawn up and a relationship has been found between the load limiter nominal actuation force and the required springs preloading force, also determined is the transmission mechanism springs stiffness, at which the overhead crane lifting mechanism drive parts moving masses runout energy is absorbed.

Keywords: *bridge type crane, overload, load capacity limiter, transmission mechanism, accuracy of overload protection*

REVERSE ENGINEERING IN THE REMANUFACTURING: METROLOGY, PROJECT MANAGEMENT, REDESIGN

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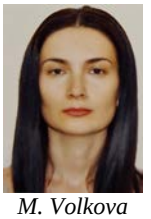
M. Volkova

ABSTRACT:
The analysis of the concepts used for engineering analysis of existing product samples is given: Remanufacturing, Repair, Reverse engineering, Redesign, Repurposing. In all cases, there is a decryption phase consisting analysis of technical state and identification. The identification involves the analysis of a design, the identification of units that make it up, the definition of technical specifications and the complete reproduction a technical documentation of existing product. The analysis of the technical condition and identification are presented using the approaches of the pattern recognition process. The problem of further use of the product after identifying the causes of destruction and studying the design and functionality is presented as the process of recognizing the project type: Repair, Redesign, Repurposing, etc. The developed approach was used to analyze the technical state and identification the transmission parameters. The design structure matrix and the morphological map of damage were used to determine the root causes of the transmission failure and the damage scenario.

Keywords: *decision rule, transmission design, project types*

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1. INTRODUCTION

The terms remanufacturing, repair, reverse engineering, redesign, upgrade, repurposing are used to denote a set of measures, when the damaged product, can again be used in any manner. The initial stage of the faulty equipment study is the decryption phase, which consists of subphases: the analysis of the technical state and the identification of its units and machine elements [1]. Along with metrology research, the identification of equipment parameters is based on the software systems CAD/CAM/CAE, which contain libraries of unified units, standard machine elements and standard parts of elements. After the identification phase, it is necessary to make a decision about the possibility of using this equipment as a whole or its individual units and elements. And also, to determine: it must be a repair, which requires the manufacture of machine elements are copies of damaged or repair and upgrading of equipment, or in the case when damage and wear are significant, you need to look for alternative equipment use.

INVESTIGATION OF THE INFLUENCE OF TAPERED THREAD PROFILE ACCURACY ON THE MECHANICAL STRESS, FATIGUE SAFETY FACTOR AND CONTACT PRESSURE

Volodymyr Kopei[1], Oleh Onysko[1], Zinivii Odosii[1], Lolita Pituley[1], Andrii Goroshko[2]
[1]Ivano-Frankivsk National Technical University of Oil and Gas
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V. Kopei *O. Onysko* *Z. Odosii* *L. Pituley* *A. Goroshko*

ABSTRACT:
Generally the oil and gas drill-strings have a big number of threaded connectors between drill pipes.These ones namedtool-jointsinfluence the all drill-string operation characteristics, because they have to provide their reliability during the process of make-up, pumping and drilling.The most important parts of the connectors are pin and box tapered thread.The effect of deviations of the flank angle of the pin thread on equivalent stresses, fatigue safety factor and contact pressures in the drilling tool-joints is studded.Axisymmetric finite-element models of drill-string tool joints with threads 2 3/8 REG and 6 5/8 REG API-sizes has been developed for this. In order to reduce contact pressures on thread flanks, negative deviations of the loaded flank angle of the pin thread should be avoided and positive should be preferred (on the condition that fatigue strength is ensured). In this regard, it is recommended to change the tolerance limits of this flank angle from (29.5°, 30.5°) to (30°, 30.5°) for the pin thread, and do not change the tolerance limits for the box thread.

Keywords: *tolerance limit, tool-joint, flank angle deviation, fatigue, contact pressure, finite-element analysis.*

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1. INTRODUCTION

Drilling of the oil and gas wells is a process whose productivity largely depends on the quality and reliability of threaded connections between drill-string pipes.These connections are called as tool-joint and consist of a pin and a box. The tapered thread istheir most important surface made by lathe. Therefore, the reliability and performance of the drilling depend on the accuracy of the turning process of the thread of the pin and the box and the strength of their material.

STRUCTURE AND STRENGTH PROPERTIES OF AL-CR ALLOYS OBTAINED BY QUENCHING FROM A LIQUID STATE AND LASER SURFACE REFLOW

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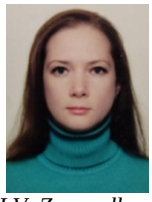
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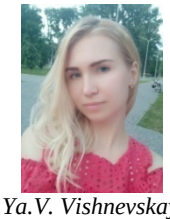
Ya.V. Vishnevskaya

ABSTRACT:
Complex studies of the structure and strength properties of Al-Cr alloys prepared in the shape of ribbons with a thickness of l=(30-80) μm by rolling a melt jet in steel rolls as well as by reflow the surface of massive samples to a depth of h≈l with millisecond laser pulses, have been carried out. It is shown that anomalously supersaturated solid solutions based on Al (α) which retain the initial concentration of alloys, are recorded in rapid-quenched ribbons with a content of up to 7 % Cr (*). In the zone of laser reflow the maximum saturation of the α-solution does not exceed ~3.2 % Cr.
In the analytical block of the work it was found that the lesser tendency of Al-Cr alloys to form strongly supersaturated solid solutions under conditions of fast laser quenching is due to the peculiarities of crystallization of the reflowed zone. In its lower part from the reflowing boundary matrix crystals of an α-solution with a Cr content close to equilibrium grow. In the upper horizons of the laser bath the formation of solid solutions of the initial composition is obstructed due to the enrichment of the melt with chromium as well as the slowing down of the cooling process due to the release of latent heat of transformation at the growth front of the matrix crystals of the α-solution.

Keywords: *Rapid quenching, laser reflow, strength properties, cooling rate, crystallization mechanisms.*

SIMULATION OF THE OPERATING MODES OF THE PROPOSED EQUIPMENT WHEN LOADING THE EXTERNAL CIRCUIT OF THE WORKING HYDRAULICS IN TRACTOR

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ABSTRACT:
The aim of the presented article is to verify the automatic and manual operating mode of the proposed measuring device for loading the external circuit of the working hydraulics of the tractor in the simulation program FluidSim. Before starting the simulation, it is necessary to select the individual parameters of the tested hydrogenerator UD 20, which is specified by the manufacturer, and to create a simulation model of this device according to the design. The device allows measurements to be made in automated mode by means of an electro-hydraulic proportional valve and in manual mode by means of a throttle valve. In the simulations in both operating modes, the flow rates at increasing speeds and constant pressures from the simulations were compared with the data provided by the hydrogenerator manufacturer. By comparing the data, it is possible to see negligible percentage differences, which are caused by the increasing temperature of the working fluid and the internal resistance of the hydrostatic transducer and filter. From these findings it follows that the proposed electromechanical device meets all the specified requirements and during real operational tests of the tractor hydraulics, its function will be correct.

Keywords: *hydrogenerator, flow characteristic, simulation, tractor, hydraulics*

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1. INTRODUCTION

Mechanization in agriculture and related activities are constantly advancing, resulting in improvements and the development of new hydraulic systems or components that are part of the working hydraulics of the tractor, as well as other working machines such as handling and forestry. The development and improvement of hydraulic systems would not be possible without quality research in the field. Current agricultural machinery and equipment is at a high technical level, which means that even measuring and diagnostic technology must meet adequate requirements for the technical level and sophistication of agricultural machinery[1,2,3,4]. In the past, with a lower level of electronization of hydraulic systems of agricultural technology, simpler and less demanding measuring devices were sufficient to perform either laboratory or operational tests of hydraulic systems.

OF NEW BIODEGRADABLE FLUID DURING ACCELERATED DURABILITY TEST

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ABSTRACT:
The article deals with the evaluation of new universal gear hydraulic biodegradable fluid MOL Farm UTTO Synt by the accelerated durability test under laboratory conditions. The operational properties of the fluid were evaluated based on its influence on the technical state of the hydrostatic pump UD 25 during the test, specifically the flow rate and flow efficiency. From the physic-chemical properties was evaluated the viscosity of the fluid, additive depletion and contamination. The viscosity, flow rate and efficiency did not exceed the manufacturer's specifications, but the level of contamination was higher. Nevertheless, the liquid shows good performance for use, as well as FT-IR spectroscopy, where no change was observed due to temperature effects on liquids and additive degradation and depletion.

Keywords: *biodegradable fluid, flow, pollution, laboratory test, FT-IR*

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1. INTRODUCTION

Environmental protection is an actual topic already for several years, and it becomes a preferred problem in the established trend of economic development [19]. Hydraulic equipment is widely used in powerful mechanisms of agricultural and forest machines as well as in many other areas [4, 15]. Currently, hydraulic systems of mobile machinery are using mainly mineral base oils, which are having good properties proven by many years of use [14]. Using a fluid that is biodegradable reduces the cost of clean-up as well as the potential for polluting the environment [1].
With the development of technology and the improvement of production processes, there is space for the development of new ecological fluids that can serve as a substitute for conventional manufactured liquids [8].

PLASTICITY STUDIES DURING DEFORMATION UNDER CONDITIONS OF SIGNIFICANT NEGATIVE VALUES OF THE STIFFNESS COEFFICIENT OF THE STRESS STATE

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ABSTRACT:
The study of the stress-deformed state of cylindrical cast iron samples under conditions of their volumetric compression was carried out applying the finite element method using the Deform software package. A technique has been developed for modeling the settlement of studied samples, which makes it possible to calculate the stress-deformed state, which is necessary to construct a plasticity diagram for low-plastic materials with significant negative values of stiffness coefficient of the stress state. Analysis of the stress-deformed state showed a significant unevenness of its distribution over the volume of settlement sample, and, consequently, a significant difference between the settlement scheme with limited radial displacements along the outer surface of the sample from the known free settlement scheme of a cylindrical sample. It has been established that the stiffness coefficient of the stress state changes significantly over the wall thickness, which allows the process of SCH20 cast iron deformation at different values of the stiffness coefficient and use the obtained results to construct its plasticity diagram. The results obtained by modeling using the finite element method and calculated analytical model showed their good overlapping, both in the value of the accumulated deformation and in the value of the stiffness coefficient of the stress state.

Keywords: *plasticity, stress-deformed state, compression, finite element method, cast iron, stiffness coefficient of the stress state.*

ROLE OF INDUSTRY 4.0 IN ALBANIAN INDUSTRY TRANSFORMATION: an integrated understanding of Industry 4.0

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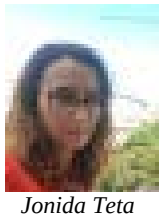
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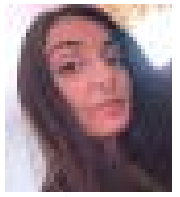
Merita Kosta

ABSTRACT:
Nowadays, industrial conditions change quickly due to the influence of globalization as well as sociological, technological, economic, and political factors. On top of that, industries have revolutionized, and continuous upgrades has taken place to strengthen its functionality of resources sharing and integration capabilities of functional units. The goal of this article is to understand and explore how adoption of Industry 4.0 technologies will impact and transform the functions of a company. For this, the index analysis helps us to identify the current potential of the country. Hence, knowing the current challenges and opportunities of the country in relation to Industry 4.0, helps us to devise a realistic implementation model. The study clears the overall picture of Industry 4.0 in the textile industry. This helps, clarifying the concept in a country where technological culture is in low terms, and in a sector where changes are required.

Keywords: *Industry 4.0, Industry 4.0 adaption, intelligent factory, basic technology, chain of global value.*

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1. INTRODUCTION

The boom of global "industrialization" influences all competitive dimensions of a company by digitizing and revolutionizing the operating approach. Hence, the traditional model is substituted for emerging model, which could be called integration of industrial chain, or industrial revolution. Industry 4.0 or the Fourth Industrial Revolution can be defined as the concept of an integration between Information and the Digital Revolution [1]. The term is the generation of three previous revolutions, with a particular focus on increased productivity and efficiency. The primary idea has been presented in Hanover's 2011 Congress, treated as a strategic programme to develop advanced production systems [2]. Among other things, this new phase of the industry requires a socio-technical evolution of human role in all business ecosystem modules. The Industry 4.0 brings the concept of automation far ahead. It creates a full digitalisation and a transformed automation process, in all its constituent stages, concluding in an “intelligent factory”. Exploring Industry 4.0, may help the engineers and entrepreneurs to resolve high uncertainties and gain more competitive advantages.

CHALLENGES OF ALBANIAN COMPANIES FOR SUSTAINABLE DEVELOPMENT IN THE ERA OF INDUSTRY 4.0.

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ABSTRACT:
Many companies have implemented technology in their production or service delivery processes. In this way, companies today see Industry 4.0 as a necessity, because it provides companies with a competitive advantage, quality product, speed and better fulfillment of customer needs and desires. However, even though companies today are using Industry 4.0, there are still problems such as: high level of resource consumption, high level of pollution, environmental changes, high unemployment rate, etc. Companies today face the pressure and the necessity of implementing sustainable development. This pressure is exerted by the community, the government and even by the universe itself. A sustainable industrial development strategy should aim to achieve the integration of environmental concerns and sustainable development in industrial policy, thereby promoting environmental protection, competitiveness, innovation and employment. In the long term, sustainable industrial development can only be achieved through the integration of all three pillars of sustainable development – economic, environmental and social. Sustainable development is not only environmental protection, it is a process in which different policy areas such as economics, trade, energy, agriculture, industry, etc., are formulated in order to create a development that is economically, socially and environmentally sustainable.
The purpose of this paper is to highlight the challenges faced by Albanian companies for the implementation of sustainable development. Through factorial analysis, this paper aims to build the model by identifying the factors that are most important in the implementation of sustainable development in Albanian companies.

Keywords: *Industry 4.0, sustainable development, Albanian companies, challenges*

“ICDBY3D” INTELLIGENT COMPONENT DEVELOPMENT FOR GAS TURBINE BY USING 3D PRINTING AT SIEMENS ENERGY AB SWEDEN

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ABSTRACT:
With great certainty, it can be said that there is no area that has gathered and influenced the new directions of development and manufacturing, as is the case of Additive Manufacturing.
Digitization, automation, robotics, software, signal technology, and monitoring, analytics are some of the more prominent areas closely related to Additive Manufacturing. In addition, Digital Twin and Big Data are new directions that have emerged in parallel in the development of Additive Manufacturing. Computer Tomography, Virtual Reality, Augmented Reality, and Artificial Intelligence are initiated areas that came in close connection with Additive Manufacturing. Currently, Siemens Energy is mainly using this technology for prototyping, manufacturing, repair of gas turbine components, and spare part manufacturing [1-4].Additive manufacturing is considered a new revolutionary method and an integral part of Industry 4.0 contributing to major changes in the manufacturing process. It is interesting to consider the aspects and results of the development achieved in this specific area in a very short time interval. At the same time, it is very important to note a development and change of job description in the physical sense. The introduction of Additive Manufacturing has influenced the design process of new components and created freedom of thought in its application. Enormous opportunities have been provided to design details with a high degree of completeness with the use of new materials as well as programs that support the whole process. Through a new mindset, Additive Manufacturing has contributed to components being designed in a completely different way and given a completely different appearance and new intelligence -intelligent components (IC) implementation have further enhanced the components in compatibility and usefulness.
The development of Additive Manufacturing is largely based on very close collaboration between universities, research institutes and industry. These three stakeholders are the main pillars for rapid and successful development where theoretical knowledge from the University are tested, validated, and implemented in industry fostering closer collaboration, knowledge sharing and development. Expanding knowledge, promoting innovation, and fostering cooperation in the Additive Manufacturing sector have been our key strategic levers to advance our mission in areas such as decarbonization, attaining further sustainability both in our own operation and in our product portfolio.

Keywords: *Additive Manufacturing, Digitalization, Digital Twin, Robotics, Automatization, Gas Turbines Development, Decarbonization, Intrapreneurship.*

INFORMATION TECHNOLOGY SOLUTIONS AND CHALLENGES FOR HEALTHY URBAN ENVIRONMENT

RJEŠENJA I IZAZOVI INFORMACIONIH TEHNOLOGIJA ZA ZDRAVO URBANO OKRUŽENJE

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Samir Lemeš

ABSTRACT:
The smart city technologies utilising IT solutions could be the keys to success in achieving sustainability of modern, growing urban areas. Smart cities are designed and based on complex and intelligent digital networks, trying to connect citizens, governments, buildings and objects that exchange information. Cloud-based software apps acquire, manage, and analyse this data, and transform it into real-time intelligence that improves the quality of life. These technologies could improve the quality of life, help reduce environmental burden, reduce energy consumption, and introduce new challenges. The main challenge that follows the initial infrastructure investments is data protection and information security. The emerging information technologies, such as BIM, Cloud Computing, Big Data, 5G, Blockchain, AI, etc. could be utilised to overcome the challenges and risks of excessive use of information and communication technologies and related risks.

Keywords: *Smart City, Healthy Urban Environment, Information Technology*

REZIME:
Tehnologije pametnih gradova koje koriste IT rješenja mogle bi biti ključuspjeha u postizanju održivosti modernih, rastućih urbanih područja. Pametni gradovi su dizajnirani i zasnovani na složenim i inteligentnim digitalnim mrežama, pokušavajući da povežu građane, vlade, zgrade i objekte koji razmjenjuju informacije. Softverske aplikacije zasnovane na oblaku prikupljaju, upravljaju i analiziraju te podatke i transformiraju ih u inteligenciju u stvarnom vremenu koja poboljšava kvalitet života. Te tehnologije mogle bi poboljšati kvalitet života, pomoći u smanjenju opterećenja na okoliš, smanjiti potrošnju energije i uvesti nove izazove. Glavni izazov koji slijedi nakon početnih ulaganja u infrastrukturu je zaštita podataka i sigurnost informacija. Informacione tehnologije u nastajanju, kao što su BIM, računarstvo u oblaku, veliki podaci, 5G, Blockchain, AI, itd., mogle bi se koristiti za prevazilaženje izazova i rizika od pretjerane upotrebe informacionih i komunikacionih tehnologija i s njima povezanih rizika.

Ključnereči: *Pametni grad, Zdravo urbano okruženje, Informacione tehnologije*

SURFACE CHARACTERIZATION OF THE COBALT-BASED ALLOY STENTS FABRICATED BY 3D LASER METAL FUSION TECHNOLOGY

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ABSTRACT:
The paper focuses on the surface characterization of cardiovascular metal stents fabricated by a promising laser-based additive manufacturing technique. The prototype stents were developed and printed by the laser powder bed fusion (LPBF) process using a biocompatible Co-Cr alloy powder. The chemical composition and microanalysis of the powder and LPBF-built alloy are addressed. The stent geometry, strut thickness, surface morphology, and defects on the surface of the 3D-printed stent strut are also studied. Results indicated that the LPBF-built stent test parts are characterized by the required geometrical accuracy, having the chemical composition without changes. The rough surface is formed in the 3D printed stents, containing various surface defects. The macrodefects in the LPBF-built Co-Cr alloy stents were not observed.

Keywords: *3D printing, laser powder bed fusion process, Co-Cr powder, cardiovascular stent, chemical composition, stent geometry, surface morphology*

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1. INTRODUCTION

The main challenges associated with medical stents are geometry, material, manufacturing process, and post-processing [1]. The metals or polymers are used for the manufacture of modern stents. Compared to the polymer stents, the metal stents are characterized by a high structural rigidity with corrosion resistance and thermal stability during implantation as well as the ability to self-expansion. The stainless steel and alloys of titanium, chromium and cobalt are most often used for the metal stents production.

Nowadays a novel additive manufacturing or three-dimensional (3D) printing technology is applied for the producing of polymer and metal components [2–5]. This technology allows eliminating multiple manufacturing constraints producing complexly shaped metal components with high precision under computer control as compared to the conventional manufacturing techniques [6]. As a result, the 3D printing technology presents huge potential to manufacture both non-metal and metal biomedical components. Whether for individual implants or for micro-implants with medicine depots, 3D printing is ideally suited for manufacturing such parts [4, 7–10].

INFLUENCE OF THE HUMAN BODY'S CENTER OF GRAVITY ON SOME ASPECTS OF LOWER LIMB MOVEMENT DURING CAD MODELING

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ABSTRACT:
In biomechanics, the determination of the center of gravity of the human body has always been an important part of many biomechanical studies, which were aimed at determining the factors of external forces acting on the elements of prostheses necessary for their construction, and predicting their durability. Since at present the design of these products is usually carried out in CAD, it is relevant to create analytical methods for determining this parameter. The article presents a method for determining the center of gravity of a human body, in which body parts are considered not just as a three-dimensional object of the main geometric forms of constant density, but as an "assembly" object that defines a three-dimensional object of variable density. The block diagram of the software implementation of the proposed method is presented. Mathematical modeling has been carried out, the results of which indicate a sufficiently high accuracy of the presented method. Ways to improve its accuracy are indicated

Keywords: *center of gravity of the human body, three-dimensional object with variable density, three-dimensional object with constant density, segmentation method, dynamic characteristics*

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1. INTRODUCTION

At present, solving the problem of determining the center of gravity of the human body requires an increase in the accuracy of such calculations, since the technical development of society leads to the creation of mechanical devices that, being located on the human body, increase its physical capabilities. These devices, in the form of orthoses located on the limbs, or an exoskeleton, transform a person into a biomechanical system. Considering that the development of such systems is increasingly carried out with the involvement of CAD, the determination of the center of gravity of a biomechanical system in these environments becomes even more relevant, since this indicator affects the dynamic properties of the system under consideration.

EFFECT OF THE M-PHENYLENEDIAMINE ON THE TRIBOTECHNICAL AND NVH CHARACTERISTICS OF THE FRICTIONAL COMPOSITE MATERIALS BASED ON PTFE

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ABSTRACT:
The effect of metaphenylenediamine contained in the "Maleid-F" modifier on the tribological and noise characteristics of highly filled friction materials based on polytetrafluoroethylene (PTFE) for stationary friction units of technological machines has been experimentally studied. It is shown that the combined use of Maleide-F modifier and short basalt fibers leads to a decrease in wear resistance of polymer composites. According to the results of tribotechnical and noise measurements it was found that introduction of Maleid-F modifier provides the best wear resistance at elevated temperatures when filling up to 20 vol.% due to reducing the dynamic elastic modulus and the deformation component of the friction force. Combined use of Maleide-F modifier and short basalt fibers also leads to a noticeable decrease in friction-induced noise at frequencies above 8-12 kHz.

Keywords: *Frictional composite materials, polytetrafluoroethylene (PTFE), stationary friction units, technological machines.*

ADVANCED SOUND ABSORBING MATERIALS TO REDUCE NOISE AND IMPROVE THE ENVIRONMENTAL SITUATION IN PRODUCTION FACILITIES AND TRANSPORTATION

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ABSTRACT:
The use of effective sound absorbing materials provides noise reduction and environmental improvement in various spheres of human life, including in residential and production premises, transportation and so on. The trends in the field of creating promising acoustic materials for use in industry and transport are considered. The advantages of using the sound-absorbing composite materials based on linen and polymer fiber and components from them for vehicle cabins are shown. The achieved acoustic and mechanical characteristics of the developed materials allow a reduction of internal noise by 3-5 dBA and meet modern safety and noise requirements.

Keywords: *Environmental noise, sound-absorbing composite materials, polymer fiber and components, vehicle cabins.*

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1. GLOBAL NOISE ISSUE

Environmental noise is one of the urgent global problems [1,2]. Whatever resources are spent by a country or industrial branch on noise abatement, the problem remains to be persistent. Moreover, on the background of the fresh legislative limitations on the noise level, actuality of the problem is only growing. Creation of less noisy machinery could not solve the task since the production is continuously incrementing. As yet, there is neither a globally recognized system of estimates for the environmental noise aftereffects nor any unified normative calculation procedures for evaluating the damage inflicted to the society by noisiness. Nonetheless, the work on elaboration of the general technical, economic and legal approaches to estimating noise effects on the environment and human medium is underway. To name but a few: adopted in 1996 the “Green Book of the European Community” is devoted to the perspective policy in the field of noise.

ENSURING THE LIFE CYCLE OF OBJECTS ON THE BASIS OF A SIGNATURE APPROACH

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ABSTRACT:
In the presented work the conceptual approach of support of a life cycle of objects of mechanical engineering based on use of the signature approach is stated. The essence of the approach is the resonant excitation of objects - elements of technological systems. The frequency spectra of resonantly excited objects are sources of information about the macro- and macro geometric characteristics of objects, as well as about the indicators of their physical and mechanical properties. Technological systems are considered as objects in relation to each element of a life cycle: preparations, cutting tools, the technological equipment and the equipment, ready details, the collected products during operation. Experimental confirmation of the influence of the resonant excitation of an object placed in a strong constant uniform magnetic field on the physical and mechanical properties of the materials of objects, in particular, on the increase of their hardness, is presented.

Keywords: *life cycle, signature, frequency spectrum, diagnostics, neural networks, intelligent models.*

ANALYSIS OF INNOVATION ACTIVITIES IN GEORGIA AS A MAJOR FACTOR IN APPLICATION OF THE INDUSTRY 4.0 CONCEPT

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ABSTRACT:
One of the main requirements for the successful implementation of the Industry 4.0 concept in a country and/or region is certainly its digital infrastructure, and the main driving factors are certainly innovation and educational and training activities. The paper presents the trend analysis of innovation activities and global innovation index (GII) in Georgia for the period 2011-2020. For GII index values for CAGR (compound annual growth rate) and AAGR (average annual growth rate) are -0.0353 and 1.39, respectively.

Keywords: *Industry 4.0, innovation, Global Innovation Index (GII), Innovation Capacity Index (ICI), Global Competitiveness Index (GCI).*

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1. INTRODUCTION

New Industry 4.0 or 4IR (fourth industrial revolution) is a new generation of digitized factories that are based on a combination of cyber-physical systems (CPS), robots and digital and Internet (IIoT, IoP, IoS, IoT and etc.) technologies [1-5].

The requirements for the successful implementation of the Industry 4.0 concept of a country and/or region are certainly: digital infrastructure, application of new technologies and education and training of personnel for a new form of production.

The trend of development and application of digital infrastructure in Georgia is presented in papers [6, 7].

The main drivers for the successful implementation of Industry 4.0 concept are certainly innovation and educational and training activities of a country and/or region.

Innovation is the practical application of new and improved ideas, resulting in the introduction of new products, materials, services, processes, methods, technologies or improvement in offering product, services, production process, etc.

TOTAL QUALITY IN A SERIAL INDUSTRY - THE CONCEPT OF A CLOSED LOOP IN A TOTAL AUTONOMOUS FLOW

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Aurel Mihail Țîțu *Vasile Gusan*

ABSTRACT:
The scientific paper presents a study on the practical perspectives aimed at achieving the ideal "Zero defects" in the automotive industry. The concept of "Zero defects" is a desideratum of all quality managers that can lead to a final goal represented by total customer satisfaction. Quality assurance is a necessity in the automotive industry and is expressed as a tool by which any organization can achieve a place as competitive as possible in the competitive market. The closed loop concept is presented as the final solution for achieving the "Zero Defects" ideal. Automation, communication, artificial intelligence and systematization applied to industrial equipment will lead to the materialization of the closed loop concept. The research presents in an elegant way the possibilities of implementing closed loop systems applicable to autonomous production systems, systems in which the inspection equipment constantly communicates with a processing equipment, and the processing parameters and coordinates are permanently adjusted, automatically with the aim of maintaining the dimensions in tolerance and close to the nominal size. Thorugh this research, the authors offer a pragmatic point of view focused on innovation and automatic inspection in the technical field..

Keywords: *total quality, quality assurance, autonomy, closed loop, series production, zero defects.*

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1. INTRODUCTION

Quality represents the most critical foundation between the customer-supplier relationship and is the keyword that opens the door to negotiations for a product or service supplier. Due to this aspect, quality standards, quality departments, and quality control of its service product emerge. This criterion greatly influences the supplier's existence on the market and its credibility in front of the existing customers and potential future customers.

However, the term quality plays a vital role in the manufacturing cost of the product and obtaining profit by the organization. The investment costs in the quality of a product can be presented graphically like an iceberg peak, these being visible costs.

DYNAMIC SIMULATION OF WORM GEARS USING CAD APPLICATIONS

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Alina Bianca Pop


Aurel Mihail Țîțu

ABSTRACT:
The new processes by plastic deformation of the gears eliminate some of the shortcomings of the old methods of their manufacture, at the same time reducing the production costs and the time of realization of the mass production. To carry out this research, the AutoDesk INVENTOR PROFESSIONAL application was chosen. A worm gear was designed, after which the calculations for the worm and worm wheel were performed. Of particular importance for gear, mechanisms are the research of dynamic loads. The use of modern calculation methods, which have wide possibilities for rapid optimization of prototypes, ensures the minimization or sometimes even exclusion of the execution of experimental samples. This possibility arose with the development of Computer-integrated manufacturing. In this context, all the steps from the idea to the final product are performed integrated on the computer. It is also important to reduce dynamic loads with different methods. By simulating the behavior of a machine or other engine-driven assemblies, one can better understand how they will operate without the need to make a real prototype. Dynamic Simulation in Autodesk Inventor Professional can be used to analyze the dynamic operating conditions of a project in a complete operating cycle. Dynamic Simulation provides analysis tools that allow the evaluation of product performance in a 3D environment.

Keywords: *worm gear, worm, worm wheel, dynamic simulation, CAD application*

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1. INTRODUCTION

Among current mechanical transmissions, geared transmissions have the widest use, ensuring compact and reliable constructions for the entire power range of the machines (from a few watts to tens of thousands of kilowatts). Geared transmissions include: gearboxes, gearboxes, drives, complex transmissions. The simplest transmission (mechanism) with gears consists of gears in gear and is called gear [1,2].The worm gear consists of two gear with inclined teeth, so that the angle between the axles is equal to the difference between the angle of the drive wheel and the angle of the driven wheel.

$$\delta = \beta 1 - \beta 2 \quad (1)$$

As a result, we can write $\gamma = 90° - \beta 1$, and the magnitude of the angle between the axes will be given by:

$$\delta = 90° - (\gamma + \beta 2) \quad (2)$$

EXPERIMENTAL-NUMERICAL ANALYSIS OF HOT FORGING PROCESS WITH MONITORING OF HEAT EFFECTS

EKSPERIMENTALNO-NUMERIČKA ANALIZA PROCESA TOPLOG KOVANJA NA ČEKIĆU SA PRAĆENJEM TOPLOTNIH EFEKATA

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M. Popović


V. Mandić


M. Delić


V. Pavićević

ABSTRACT:
The paper deals with the experimental-numerical analysis of the hot forging process on a hammer, where the main focus is on monitoring the thermal effects that occur in this metal forming technology. This includes measuring and numerically estimating the temperature fields in the workpiece and forging tools in multi-stage forging process. For this purpose, a thermal imaging camera for measuring the temperature in the industrial process and Simufact.forming software for numerical modelling of the process using the finite volume method were used. The results presented in the paper show that the complementary application of numerical simulations and industrial measurements enables the identification of thermal effects on both, workpiece and tools, in the entire technological process of multi-stage forging, through precise determination of input parameters for numerical simulations by infrared thermography.

Keywords: *numerical simulation, forging, infrared thermography, temperature fields*

REZIME:
U ovom radu je izvršena eksperimentalno-numerička analiza procesa toplog kovanja na čekiću, pri čemu je glavni fokus na praćenju toplotnih efekata koji se javljaju u ovoj tehnologiju obrademetala deformisanjem. To je obuhvatilo merenje i numeričku procenu temperaturnih polja uobratku i kovačkim alatima za dve operacije kovanja. U tu svrhu su korišćeni termovizijskakamera za merenje temerature u industrijskom procesu i softver Simufact.forming za numeričkomodeliranje procesa primenom metode konačnih zapremina. Rezultati predstavljeni u radupokazuju da komplementarna primena numeričkih simulacija i industrijskih merenja omogućavaidentifikaciju toplotnih efekata u celokupnom tehnološkom procesa višeoperacionog kovanja naobradak i alate kroz precizno definisanje ulaznih parametara za simulacije posredstvominfracrvene termografije.

Ključnereči: *numerička simulacija, kovanje, infracrvena termografija, temperaturna polja*

DEPENDENCE ANALYSIS OF THE FRICTION FORCE FROM TIME OF BIOCOMPATIBLE MATERIALS

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R. Turmanidze *G. Popkhadze*

ABSTRACT:
Implants with the friction couple (0,0025-0,005 mm a year) in comparison with the friction pair metal-polyethylene (0,5 mm a year) with a problem of use of CoCrMo alloy is the exit of a big amount of the metal particles of nano-size that lead to the pathological changes in the organism of patients because of osteolis (inflammation of surrounding tissues), metallos, lysis of the bone tissue and also appearance of products of abrasion in the internal organs of patients. A part of patients has a hyper-sensitive reaction of later type that can limit the use of such implants. Besides that the data of various centers demonstrate the chronicle increase of level of cobalt and chrome in the blood serum and accordingly there is a conversation about the influence of exit of ions of these metals on the organism as a whole. At present the metallic bearing surfaces are contra-indicated to the patients with kidney insufficiency of the danger of development of such problems and refers to such implants to women of childbearing age. In this paper is given dependence analysis of the friction force from time of biocompatible materials, which are used as implants for endoprostheses of joints.

Keywords: *Implant, joint endoprostheses, friction, metal-polyethylene, low-temperature precision grinding (LPG).*

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1. INTRODUCTION

In recent years, it happens that many young people have problems with hip joints. The condition used to be related to older people exclusively, but nowadays it increasingly affects younger people and it is not necessarily related to injuries or traumatic fractures. Thus, it is required to pay specific attention to each case, to select appropriate materials, improve processing quality and accuracy. The implants must possess high performance properties since they are to last more than 30 years because more and more young people have this problem. It is believed that this happens due to the changed life style, lack of activity, poor nutrition and so on. Unhealthy life habits lead to the increase of many problems with the bone system. Consequently, the need for artificial implants, particularly for hip joints, abruptly increases. The use of biomaterials as implants for joint endoprostheses is presented in [1-7].

RESEARCH OF THE SURFACE ROUGHNESS PARAMETERS AFTER END MILLING

ISTRAŽIVANJE PARAMETARA HRAPVOSTI OBRAĐENE POVRŠINE NAKON GLODANJA VRETENASTIM GLODALOM

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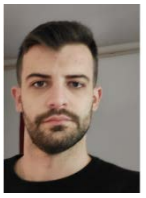


Matej Kljajo *Danijel Šogorović*

ABSTRACT:
This paper examines the influence of technological parameters (elements of the cutting process) on the roughness of the surface in the end milling process. The aim of the paper is to analyse the impact of cutting speed (v_c) and feed speed (v_f) on the roughness parameter R_a.
The machine tool, tool used, the material and the device for measuring of the roughness parameters are shown. This experiment gives an adequate mathematical model of the first degree of this influence for prototype of universal end mill (N type) for milling of materials of P group, which describes the effect of technological parameters on roughness.

Keywords: *end mill; surface roughness; technological parameters; model.*

REZIME:
U radu se istražuje utjecaj tehnoloških parametara (režima obrade odvajanja čestica) na hrapavost obrađene površine kod glodanja vretenastim glodalom. Cilj je analizirati utjecaj brzine rezanja (v_c) i brzine pomoćnog kretanja (v_f) na parametar hrapavosti R_a.
U radu su prikazani alatni stroj, alat koji se koristio, kao i uređaj za mjerenje parametara hrapavosti obrađene površine.Prikazani eksperiment daje adekvatni matematički model prvog stupnja koji opisuje utjecaj tehnoloških parametara na površinsku hrapavost za prototip univerzalnog vretenastog glodala (N tipa) za glodanje materijala P grupe.

Ključne riječi: *vretenasto glodalo; površinska hrapavost; tehnološki parametri; model.*

SERVICE ROBOTS AND ARTIFICIAL INTELLIGENCE FOR FASTER DIAGNOSTICS AND TREATMENT IN MEDICINE

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E. Husak

S. Isić

E. Karabegović

M. Mahmić

ABSTRACT:
The development of new technologies such as information and communication technologies, electronics, sensor technology, etc. lead to the development of service robots and systems, which are used in all segments of human life. One of the most important roles of service robots today isapplication in the field of medicine. Service robots in medical institutions are used to perform simple or complex tasks. Simple tasks include deliveries of drugs, food or mail to medical facilities, while complex tasks include robotic systems used in operating rooms or even to perform operations using suitable robotic systems whose design and applied technology allow it, such as Zeus and Da Vinci systems. Service robots help doctors perform their tasks easier, safer, more accurately and faster. The paper illustrates examples of the application of service robots in diagnostics, radiation, surgery, remote treatment, rehabilitation, drug distribution, patient care and disinfection of rooms in medical institutions. The rapid development of new technologies had made it possible to free people from routine mental activities, and in the future more and more complex thought activities, such as: learning, analyzing, adapting, concluding, making decisions, etc. We come to the conclusion that there is a need for the application of artificial intelligence. The combination of service robots and artificial intelligence leads to the development of autonomous systems. Autonomous systems are developed in a targeted way so that they can surpass man himself in some properties, such as: physical strength, memory capacity, computational speed, parallel execution of several control actions, etc. The paper presents the role and application of artificial intelligence in diagnostics and treatment of various diseases.

Keywords: *service robot, artificial intelligence, medicine, diagnostics, disease*

HIBRIDNI SISTEMI ZA KONTROLU VIBRACIJA

HYBRID VIBRATION CONTROL SYSTEMS

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S. Mehremić


S. Isić


M. Obradović

ABSTRACT:
The progress in active constrained-layer damping (ACLD) that has been made over the past years is presented in this paper. These systems are also called hybrid systems. ACLD treatments combine the best features of passive and active control of structural vibrations. Well-established techniques for passive control of structural vibrations and noise are described. A concise discussion of the development of so-called ‘smart’ actuators and sensors and the emergence of suitable control algorithms show how passive techniques were extended to produce ACLD. It is shown how the passive and active components of ACLD complement each other to enable control of both high and low frequency modes of vibration. The active elements allow structures to adapt to suit a changing environment while the passive elements provide a fail-safe mechanism. Because of the available technology, these benefits are available without significant penalties in terms of cost, weight and complexity.

Keywords: *active vibration control, passive vibration control, smart materials and structures, active constrained-layer damping, hybrid systems*

SAŽETAK:
U ovom radu prikazan je napredak u aktivnom prigušivanju vibracija pomoću dodatnih ograničenih slojeva (ACLD) koji je postignut proteklih godina. Ovi sistemi su još poznati kao hibridni sistemi. ACLD sistemi kombinuju najbolje osobine pasivne i aktivne kontrole strukturnih vibracija. Opisane su testirane tehnike za pasivnu kontrolu strukturnih vibracija i buke. Kroz diskusiju razvoja takozvanih „pametnih“ aktuatora i senzora i nastanka prikladnih upravljačkih algoritama prikazano je proširenje pasivne tehnike kako bi se dobio ACLD sistem. Prikazano je kako se pasivne i aktivne komponente ACLD međusobno dopunjuju kako bi se postigla kontrola i viših i nižih modova vibracija. Aktivni elementi omogućavaju strukturi da se prilagodi okruženju, dok pasivni elementi omogućavaju zaštitne mehanizme. Zbog dostupne tehnologije, ove su pogodnosti dosta jednostavne i široko dostupne bez velikih troškova i povećanja kompleksnosti.

Ključne riječi: *aktivna kontrola vibracija, pasivna kontrola vibracija, pametni materijali i konstrukcije, aktivno prigušivanje ograničenih slojeva, hibridni sistemi*

INTERNET OF ROBOTIC THINGS

INTERNET ROBOTSKIH STVARI

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University of Bihać, Bosnia and Herzegovina

Samir Vojić

ABSTRACT:
The Internet of Things (IoT) is bringing us unprecedented insight into and control over the world about us; in our homes, factories, offices, city infrastructures, farms and more. It does so by connecting large numbers of smart edge devices to powerful, cloud-based computing and analytics resources. The concept of integrating teams of robots and the IoT has been named as „the Internet of Robotic Things", or IoRT.Robotic principles of sensing, movement, mobility, manipulation, autonomy and intelligence are enhanced by The Internet of Things.This article describes Internet of Robotic Things architecture, key concepts and characteristics.

Keywords**:** *internet of things, robotics, internet of robotic things, network robot systems*

SAŽETAK:
Internet stvari (IoT) donosi nam neviđeni uvid u svijet i kontrolu u našim domovima, tvornicama, uredima, gradskoj infrastruktur, farmama itd. To čini povezivanjem velikog broja pametnih rubnih uređaja sa moćnim računarskim i analitičkim resursima koji se temelje na oblaku.Koncept integracije timova robota i IoT naziva se internet robotskih stvari (IoRT). Robotski principi osjećaja, kretanja, mobilnosti, manipulacije, autonomije i inteligencije pojačani su internetom stvari. Ovaj rad opisuje arhitekturu, ključne koncepte i karakteristike interneta robotskih stvari.

Ključne riječi: *internet stvari, robotika, internet robotskih stvari, mreža robotskih sistema.*

ANALIZA UTICAJA MOGUĆNOSTI SAVREMENIH RAČUNARA NA PRIMJENLJIVOST KOMBINATORIČKE OPTIMIZACIJE

ANALYSIS OF IMPACT OF POSSIBILITIES OF MODERN COMPUTERS ON APPLICABILITY OF COMBINATORIAL OPTIMIZATION

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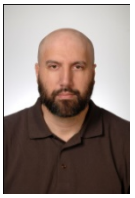


S. Isić *M. Obradović* *S. Mehremić*

ABSTRACT:
Combinatorial optimization is the simplest method of optimizing problems with discrete values of design variables. This method always finds the global extreme of the objective function, unlike classical methods based on gradient calculation or modern heuristic methods. A large number of combinations of discrete variable value distributions for problems with large number of design variables leads to a time-consuming solution process, so this method has not been used significantly. This paper presents an analysis of the impact of the rapid increase in the speed of modern computers on the possibilities of applying combinatorial optimization. The analysis was performed on the problem of mass minimization of plane truss with discrete values of rod cross section. Up to 10^{10} possible combinations have been tested on processors of different speeds.

Keywords: *combinatorial optimization, combination number, CPU frequency, process acceleration*

SAŽETAK:
Kombinatorička optimizacija je najjednostavniji metod optimizacije problema sa diskretnim vrijednistima projektujućih varijabli. Ovaj metod uvijek pronalazi globalni ekstrem funkcije cilja, za razliku od klasičnih metoda baziranih na izračunavanju gradijenatra ili modernih heurističkih metoda. Veliki broj kombinacija rasporeda diskretnih vrijednosti varijabli za probleme sa više projektujućih varijabli vodi do vremenski zahtjevnog procesa rješavanja, pa se ovaj metod nije značajnije koristio. U ovom radu je prikazana analiza uticaja rapidnog povećanja brzine savremenih računara na mogućnosti primjene kombinatoričke optimizacije. Analiza je izvršena na problemu minimizacije mase rešetke sa diskretnim vrijednostima poprečnog presjeka štapova. Testirano je do 10^{10} mogućih kombinacija na procesorima različite brzine.

Ključne reči: *kombinatorička optimizacija, broj kombinacija, brzina procesora, ubrzanje procesa*

SIZE AND TOPOLOGY OPTIMIZATION OF STRUCTURES

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Ermin Husak *Mehmed Mahmić*

ABSTRACT:
In the first part of this paper, the results of size optimization of truss are given. A minimum mass was required as an objective function. Four optimization methods were used in optimization: nonlinear programming, genetic algorithms, particle swarm optimization and ant colony optimization. The obtained results are presented in the corresponding table. The second part of the paper presents the results of topology optimization using ANSYS software. In this case, the minimum value of compliance of structure for different mass values is used as an objective function.

Keywords: *optimization, size, topology, truss, structure.*

REZIME:
U prvom dijelu ovog rada dati su rezultati optimizacije dimenzija rešetke. Kao funkcija cilja tražena je minimalna masa. U optimizaciji su korištene četiri metode optimizacije i to: nelinearno programiranje, genetski algoritmi, optimizacija rojem čestica i optimizacija kolonijom mrava. Dobijeni rezultati su predstavljeni u odgovarajućoj tabeli. U drugom dijelu rada dati su rezultati optimizacije topologije koristeći se softverom ANSYS. U ovom slučaju kao funkcija cilja tražena je minimalna fleksibilnost strukture za različite vrijednosti mase.

Ključne riječi: *optimizacija, dimenzija, topologija, rešetka, stuktura.*

HEXACOPTER DESIGN AND ANALYSIS

DIZAJN I ANALIZA HEKSAKOPTERA

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Isad Šarić


Adnan Mašić


Muamer Delić

ABSTRACT:
Within the work, on the basis of previously obtained real components, the design, dimensioning and analysis of hexacopters were performed. The 3D virtual model was developed using the SolidWorks software package, and then the necessary stress analysis by the finite element method was performed.After 3D modeling, an analytical load calculation was performed on the hexacopter landing and take-off mechanism.During the calculation, real loads were used during the landing and take-off of the hexacopter.After the analytical calculation, a numerical analysis was performed using the finite element method, where the mechanisms for landing and taking off hexacopters were observed separately. In FEM analysis, the main stresses at characteristic places were observed, as well as displacements or deformations on the take - off mechanism. After that, a comparison of analytical calculation and numerical (FEM) analysis of the hexacopter structure was performed. On that occasion, a good match between the results of these two methods was established, which verified the numerical method used.

Keywords: *drone, hexacopter,design,composite materials,stressanalysis.*

REZIME:
U okviru rada je, na osnovu prethodno pribavljenih realnih komponenti, izvršena sinteza (oblikovanje i dimenzionisanje) i analiza heksakoptera. 3D virtualni model je razvijen korištenjem softverskog paketa SolidWorks, a zatim je provedena i neophodna naponska analiza metodom konačnih elemenata u istom. Nakon 3D modelranja izvršen je proračun mehanizma za slijetanje i polijetanje heksakoptera. U tok u proračuna korišteno je realno opterećenje mehanizma za polijetanje i slijetanje heksakoptera. Nakon analitičkog proračuna urađena je numerička analiza korištenjem metode konačnih elemenata, gdje su mehanizmi za polijetanje i slijetanje posmatrani odvojeno. Numeričkom analizom utvrđeni su glavni naponi na karakterističnim mjestima, kao i pomjeranja odnosno deformacije na mehanizmu za polijetanje. Nakon toga izvršeno je poređenje analitičkog proračuna i numeričke (MKE) analize posmatrane strukture heksakoptera. Također urađena je kompletna tehnička dokumentacija heksakoptera. Tom prilikom utvrđeno je dobro poklapanje rezultata ove dvije metode, te smo time verifikovali korištenu numeričku metodu.

Ključne riječi: *dron, heksakopter,dizajn, naponska analiza, kompozitni materijali*

NUMERICALAND EXPERIMENTAL STRESS ANALYSIS OF A THIN-WALLED CYLINDRICAL TANK WITH A FLAT BOTTOM

NUMERIČKA I EKSPERIMENTALNA ANALIZA NAPONA TANKOZIDNOG CILINDRIČNOG REZERVOARA SA RAVNIM DNOM

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E. Mešić


M. Delić


N. Pervan


A. Muminović


V. Hadžiabdić

ABSTRACT:
Methodology for design of a thin-walled cylindrical thank with a flat bottom is presented in this paper. Except design, methodology for analytical, numerical and experimental analysis of stresses on the thank is also presented. After analytical calculations, geometrical modeling is carried out using CAD/CAM/CAE system CATIA. Distribution and values of principal strains and stresses arepresented. Mathematical and numerical model is developed for linear elastic and isotropic material. In addition, introduction is given for theory of stresses for thin-walled thanks. For numerical structural analysis finite element method is used. Experimental stress analysis is carried outby tensometric measuring. Comparison of results from analytical, numerical and experimental analysis a predominantly good agreement with certain deviations can be found.

Keywords: *analytical calculations,geometrical modeling, FEM analysis, tensometric measurement*

REZIME:
Tema ovog rada je konstruisanje rezervoara sa ravnim dancetom gdje je potrebno poslije analitičkog proračuna uraditi i numeričku analizu (utvrditi napone na MKE modelu) te uraditi eksperimentalnu analizu plašta posude. Nakon analitičkog proračuna izvršeno je 3D geometrijsko modeliranje posude pomoću CAD/CAM/CAE softverskog sistema CATIA V5. Data je raspodjela normalnih napona i efektivnog ili Von Misesovog napona, koja je pokazala mjesta koncentracije napona na posudi i intenzitet napona na tim mjestima. Matematski model i numerički proračun urađeni su za linearno elastičan i izotropan materijal. Nakon teorijskog prikaza naponskog stanja u tankostijenim posudama pod pritiskom, za analizu naponskog stanja primjenjena je metoda konačnih elemenata. Na kraju rada je izvršeno eksperimentalno određivanje napona na plaštu posude i poređenje rezultata dobijenih analitičkom, numeričkom metodom.

Keywords: *analitički proračun, modeliranje, FEM analiza, tenzometrijska mjerenja*

DESIGN AND DEVELOPMENT OF STREET LAMP

DIZAJN I RAZVOJ ULIČNE LAMPE

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I. Šarić *E. Muratović* *S. Rahimić*

ABSTRACT:
Throughout the history, technical solutions were formed due to necessity of solving specific problem with usage of tools, mechanisms and similar devices.For that reason, with development of diode technology, LED (Light Emitting Diode) lightning solution imposed as an eligible method for surface lightening. In recent period, it is noticed that LED diodes can triple their light-emitting power. This property is one of the primary reasons that have led to modern light sources which use LED solutions. Main goal of this research is to create high-efficeint LED lamp that pleases lightning needs of public areas and has better economical features than existing HID (Hight-Intensity Dischare) solutions. Research features basic principles of new product design, along with necessary structural analysis and simulations that give insight of complete design performances and characteristics.

Keywords: *LED, HID, Product design, Analysis, Simulation, Technology*

REZIME:
Kroz historiju, tehnička rješenja su formirana iz potrebe za rješavanjem određenog problema korištenjem alata, mehanizama i sličnih uređaja.Iz tog razloga, razvojem tehnologije dioda, LED (Light Emitting Diode) rješenja se nameću kao poudane metode osvjetljavanja površina. U posljednje vrijeme, opaženo je da LED diode mogu utrostručiti snagu kojom emituju svjetlost. Ovo svojstvo je jedno od primarnih razloga koje je dovelo do korištenja LED rješenja osvjetljavanja, kao modernih izvora svjetlosti. Glavni cilj ovog istraživanja je kreianje visoko-efikasne LED lampe koja će zadovoljiti potrebe osvjetljavanja javnih površina i imati bolje ekonomske karakteristike od postojećih HID (High-Intensity Discharge) rješenja. Istraživanje objedinjuje osnovne principe razvoja proivoda, zajedno sa neophodnim strukturnim analizama i simulacijama čime se dobija potpun uvid u performanse i karakteristike procesa konstruisanja.

Keywords: *LED, HID, Razvoj proizvoda, Analiza, Simulacija, Tehnologija*

ANALYTICAL CALCULATION AND FEM ANALYSIS OF SINGLE GIRDER BRIDGE CRANE MADE OUT OF HOT-ROLLED PROFILES

ANALITIČKI PRORAČUN I MKE ANALIZA MOSNE DIZALICE IZRAĐENE OD TOPLOVALJANIH PROFILA

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ABSTRACT:
With the development of science and rapid growth of engineering needs for suitable structural analysis softwares, FEM (Finite Element Method) analysis has become one of the main tools for design process.At the same time, this approach enables effective real-time data manipulation that reduces design process time to minimum.Bridge cranes are one of the most widely used cranes for material transport in modern production and they represent complex systems. Empirical design is most often used for crane's necessary structure calculations and other design parameters that have direct impact on production performance. After calculation is performed, geometric 3D model of single girder bridge crane is created in CATIA (Computer Aided Three-dimensional Interactive Application) software. Geometric 3D model was than subjected to FEM analysis in same software.

Keywords: *Finite elemene method, Design, Bridge crane, Bending,Deflection*

REZIME:
Razvojem nauke i brzim rastom inženjerskih potreba za prikladnim softverom za strukturnu analizu, MKE (Metod Konačnih Elemenata) analiza je postala jedna od glavnih alatki za proces kosntruisanja. Istovremeno, ovakav pristup omogućava efektivniju manipulaciju podataka u stvarnom vremenu i smanjuje vrijeme procesa konstruisanja na minimum.Mosne dizalice su jedne od najviše korišenih dizalica za transport materijala u modernoj proizvodnji i predstavljaju kompleksne sisteme. Empirijsko konstruisanje se najčešće koristi za neophodne proračune dizalica i druge konstrukcione parametre koji imaju direktan uticaj na proizvodne performanse. Nakon provedenog proračuna, kreiran je geometrijski 3D model jednogredene mosne dizalice u CATIA (Computer Aided Three-dimensional Interactive Application) softveru. Geometrijski 3D modelje zatim podvrgnut FEM analizi u istom softveru.

Ključne riječi: *Metod konačnih elementa, Konstruisanje, Mosna dizalica, Savijanje, Ugib*

DEVELOPMENT AND DESIGN OF A MACHINE FOR HYBRID MANUFACTURING
RAZVOJ I DIZAJN MAŠINE ZA HIBRIDNU PROIZVODNJU

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ABSTRACT:
This paper presents the methodology for development and design of a machine for rapid prototyping with integrated hybrid manufacturing technology. Hybrid manufacturing technology is technology which can manufacture parts by adding and removing materials during the same manufacturing process. Methodology includes all phases of product development and design. From initial concept development, selecting optimal solution, development of 3D CAD models, up to technical documentation and manufacturing of a machine. At the end of a paper comparison between developed machine and other similar machines are carried out. Advantages and disadvantages of developed machine are highlighted. Also most important properties of developed machine for manufacturing of prototypes and final parts are presented.

Keywords: *product development and design, hybrid manufacturing, rapid prototyping, computer aided design (CAD)*

SAŽETAK:
U ovom radu prikazana je metodologija razvoja, dizajna i izrade mašine za brzu izradu prototipova sa integrisanom tehnologijom hibridne proizvodnje. Hibridna proizvodnja podrazumijeva tehnologiju koja omogućava obradu komada sa skidanjem i dodavanjem materijala u toku istog procesa obrade. Metodologija uključuje sve faze razvoja i dizjna novog proizvoda, od razvoja koncepta, izbora optimalne varijante, razvoja 3D CAD modela pa do tehničke dokumentacije i izrade prototipa mašine. Na kraju rada napravljena je usporedba razvijene mašine sa mašinama trenutno dostupnim na tržištu. Prikazane su prednosti i mogućnosti upotrebe hibridne mašine u procesu izrade prototipova i finalnih proizvoda.

Ključne riječi: *razvoj i dizajnnovog proizvoda, hibridna proizvodnja, brza izrada prototipova, računarom podržano konstruisanje (CAD)*

INTERACTIVE MECHANICAL DONATION BOX

INTERAKTIVNA MEHANIČKA KUTIJA ZA DONACIJE

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Alma Žiga


Belmin Hinović

ABSTRACT:
An interactive donation box allows you to run an animation by inserting coins, which would be partly a service for donation. The animation would use certain symbols to tell the story of the association (foundation or individual) about the purpose of the donated coins. The design of such a box can be purely mechanical due to the shape and weight of the coins themselves. When rolling down a steep plane, the potential and kinetic energy of the coin is partly converted into the kinetic energy of the rotation of the elements on the track. The elements can have rotational or oscillatory motions. The analysis in the paper will show that the mass of the oscillating elements must be less than 64 percent increased mass of 1 KMcoin. CAD software and 3D printing technology are ideal combination to produce such small elements.This paper will show some symbols withthe elements which rotate or oscillate after collision with the rolling coin.

Keywords: *interactive donation box, rolling coin, conservation of angular momentum*

SAŽETAK:
Interaktivna kutija za donacije omogućava pokretanje animacije umetanjem novčića, što bi djelimično bila usluga za donaciju. Animacija bi koristila određene simbole kako bi ispričala priču udruženja (fondacije ili pojedinca) o svrsi doniranih kovanica. Dizajn takve kutije može biti čisto mehanički zbog oblika i težine samih novčića. Pri kotrljanju niz strmu ravan, potencijalna i kinetička energija novčića dijelom se pretvara u kinetičku energiju rotacije elemenata na stazi. Elementi mogu imati rotaciono ili oscilatorno kretanje. Analiza u radu će pokazati da masa oscilirajućih elemenata mora biti manja od 64 posto povećane mase kovanice od 1 KM. CAD softver i tehnologija 3D printanja idealna su kombinacija za proizvodnju tako malih elemenata. Ovaj rad će prikazati neke simbole s elementima koji se okreću ili osciliraju nakon sudara s kotrljajućim novčićem.

Ključne riječi: *interaktivna kutija za donacije, kotrljajući novčić, očuvanje momenta količine kretanja*

DEVELOPMENT OF THE CONCEPT OF THE INTEGRATED HYDRAULIC SYSTEM OF THE KNEE PROSTHESIS

RAZVOJ KONCEPTA INTEGRISANOG HIDRAULIČNOG SISTEMA PROSTEZE KOLENA

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R. Dedić


Ž. Husnić


F. Ustamujić


Z. Jelačić

ABSTRACT:
To perform high demanding power activities, transfemoral prosthesis must be powered, primarily in its main joints – knee and ankle. Specialized control unit is developed in order to achieve required kinematics and dynamics to enable it to perform high power demanding activities in more natural manner, especially stair ascent.
This paper describes the concept of a new type of knee prosthesis with integrated hydraulic systems. The knee and ankle drives are completely physically separated. The entire hydraulic system is located in the lower leg area of the upper leg prosthesis.

Keywords: *upper leg prosthesis, hydraulic system, climbing stairs*

SAŽETAK:
Za obavljanje visoko zahtjevnih energetskih aktivnosti, natkoljenična proteza se mora napajati, prvenstveno u glavnim zglobovima - koljenu i gležnju. Razvijena je i specijalizirana upravljačka jedinica kako bi se postigla potrebna kinematika i dinamika, te omogućilo obavljanje zahtjevnih zadataka, kao što je penjanje uz stepenice, na prirodniji način.
Ovaj rad opisujekonceptnovevrsteprotezekoljena s integriranimhidrauličkimsustavima. Pokreti koljena i gležnja potpuno su fizički odvojeni. Cijeli hidraulički sustav smješten je u predjelu potkoljenice natkoljenične proteze.

Ključne riječi: *nadlaktica, hidraulični sustav, penjanje na stepenice*

DICTIONARY BASED BRUTE FORCE ATTACK – STUDY CASE OF MONTENEGRO AND CHINA

BRUTE FORCE NAPAD ZASNOVAN NA RJEČNIKU – ISTRAŽIVANJE CRNE GORE I KINE

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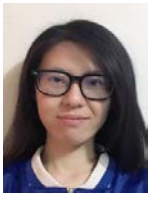
M. Đukanović


L. Novićević


L. Zhu


P. Jiang

ABSTRACT:
One of the most common cyber-attacks is brute force attack which puts users at a high security risk. This paper deals with statistical analysis and comparison of passwords' strength between two countries - Montenegro and PR of China through the help of extensive digital survey. In-depth analysis has helped us conclude what is the role of culture and computer literacy while creating stronger passwords and improving cyber security. Also, the results show the passwords' differences that help the creation of a perfect dictionary that can be used as a starting point for programming a brute force attack. One more purpose of this research is to help employees in law enforcement dealing with digital forensics, to find digital evidence in cyber incidents in the shortest amount of time.

Keywords: *Dictionary based brute force attack, cyber security, password strength, data comparison.*

REZIME:
Jedan on najčešćih sajber napada je brute force napad koji izlaže korisnike veoma velikom riziku. Ovaj rad se bavi statističkom analizom i upoređivanjem jačine lozinke između dvije zemlje – Crne Gore i Narodne Republike Kine pomoću opsežnih digitalnih upitnika. Duboka analiza pomogla nam je da zaključimo koja je uloga kulturne i kompjuterske pismenosti u stvaranju jače lozinke i unaprijeđivanja sajber zaštite. Takođe, rezultati pokazuju razlike u lozinkama koje nam pomažu u stvaranju idealnog rječnika koji se može koristiti kao početna tačka za izvođenje brute force napada. Još jedna svrha ovog istraživanja je da pomogne zaposlenima koji se bave digitalnom forenzikom u kriminalističkoj službi, da u najkraćem roku pronađu digitalne dokaze kada se dogod isajber incident.

Ključne reči: *Brute force napad zasnovan na rječniku, jačina lozinke,upoređivanjepodataka.*

A COMPARISON OF THE CMM AND MEASURING SCANNER FOR PRINTING PRODUCTS GEOMETRY MEASUREMENT

POREĐENJE MJERENJA NA CMM I MJERNOM SKENERU ZA UTVRĐIVANJE GEOMETRIJE PRINTANOG PROIZVODA

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Almira Softić


Hazim Bašić


Kenan Baljić

ABSTRACT:
The paper presents an analysis of a product made by 3D printing using CMM and a measuring scanner. Special attention is paid to the comparison of the CMM measurement and scanner with the aim of optimal selection of measurement method depending on the measuring object characteristics which need to be obtained. For the purpose of comparing measurement methods, the product was made using 3D printing technology (FDM) based on 3D CAD model which will serve as a reference basis for measuring deviations on actual model. CMM on which the measurement was performed is a five-axis CMM (three translational and two rotational degrees of freedom) manufactured by Hexagon. The software used on the CMM is PC-DMIS 2018. Scanning was performed with a structured light scanner from Steinbicher using the required softwares (Colin3D, InspectPlus and GOM Inspect). A direct comparison of the measurement procedures on the CMM and the scanner of one product obtained on a 3D printer is given below.

Keywords: *CMM, measuring scanner, 3D printing product*

REZIME:
U radu je prikazana analiza 3D printanog proizvoda korištenjem CMM i mjernog skenera. Posebna pažnja je posvećena poređenju postupaka mjerenja na CMM i mjernom skeneru sa ciljem optimalnog odabira potrebnog postupka mjerenja zavisno od karakteristika mjernog objekta koje se žele dobiti. Za potrebe poređenja postupaka mjerenja proizvod je napravljen metodom 3D printanja (FDM tehnologijom) na osnovu 3D CAD modela koji će služiti kao referentna osnova za mjerenje odstupanja u odnosu na izrađeni model. Korištena CMM predstavlja petoosnu CMM (tri translatorna i dva rotaciona stepena slobode) proizvođača Hexagon. Korišteni softver na CMM je PC-DMIS 2018. Skeniranje je izvršeno sa skenerom sa strukturirajućim svijetlom proizvođača Steinbicher uz upotrebu potrebnih softvera (Colin3D i InspectPlus). Direktno poređenje mjerenja na CMM i mjernom skeneru na proizvodu dobivenom na 3D printeru je dato u nastavku.

Ključneriječi: *CMM, mjerni skener, 3D printani proizvod*

MEASUREMENT OF NACA AIRFOIL CHARACTERISTIC PARAMETERS ON 3D PRINTED MODELS
MJERENJE KARAKTERISTIČNIH PARAMETARA NACA AEROPROFILA NA 3D PRINTANIM MODELIMA

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K. Varda


E. Bešlagić


N. Zaimović-Uzunović

ABSTRACT:
Engineering measurement of complex geometrical models shapes, is done by using unconventional measurement equipment rapidly developed in recent time. Coordinate measuring machines are widely used for this purpose, but CMM have certain limitations which are reflected in the impossibility of positioning models of complex shapes and materials, as well as the precision of registrating coordinates on such models. So, 3D scanners are also appropriate tools for complex shape model measurements. This paper presents the process of making NACA 4415 model using 3D printers, Ultimaker S5and Formlabs Form 3. Real, 3D printed complex models, are scanned using 3D scanner Range Vision Pro and its software. Authentic 3D CAD NACA models type of airfoil are created for the purpose of measurement of characteristic parameters defined by the standard. GOM Inspect software enable a comparison of nominal CAD models with scanned object models created on the above-mentioned printers. The results of comparisons are shown in the paper conclusions as the numerical values of geometrical parameters between scanned models performed on different printers.

Keywords: *airfoil, NACA, measurement, geometry deviation, metrology*

SAŽETAK:
Inženjersko mjerenje modela kompleksnih geometrijskih oblika koje se vrši nekonvencionalnim mjerilima, ubrzano se razvija u novijem vremenu. Koordinatne mjerne mašine su široko u upotrebi kada su ova mjerenja u pitanju, ali CMM ima određena ograničenja koja se ogledaju u nemogućnosti pozicioniranja modela kompleksnih oblika i materijala, kao i u preciznosti registracije koordinata na ovakvim modelima. Iz tog razloga, 3D skeneri su također prihvatljivi alati za mjerenje modela kompleksnih oblika. Ovaj rad pokazuje proces izrade NACA 4415 modela koristeći 3D printere, Ultimaker S5 i Formlabs Form 3. Realni, 3D printani kompleksni modeli su skenirani RangeVision Pro 3D skenerom. Autentični 3D CAD NACA modeli aeroprofila su kreirani za ovo mjerenje karakterističnih parametara profila definisanih standardom. GOM Inspect softver omogućava komparaciju nominalnih CAD modela i skeniranih modela objekata izrađenih na gore navedenim printerima. Rezultati komparacije su prikazani u zaključku rada kao numeričke vrijednosti geometrijskih parametara skeniranih modela izrađenih na različitim printerima.

Ključne riječi: *aeroprofil, NACA, mjerenje, geometrijsko odstupanje, metrologija*

ANALYSIS AND IMPROVEMENT OF INDUSTRIAL PRODUCTION LINES ASSISTED BY 3D PRINTING

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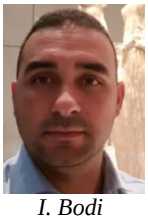
E. Piperi


I. Bodi


D. Sinoimeri


T. Spahiu


J. Kaçani

ABSTRACT:
Product quality as well as product performance, plays a significant role inclient satisfaction. Production linemanagers are interested in increasing productivity through implementing new strategies andimproving the traditional way of production. Based in internal audit claims for non-conformity products, it was found that the operators didn't understood the mounting process.This paper analyzes and shows a practical case how assembly production lines, in a manufacturing company in Albania,benefitted from advanced technologies as 3D printing. The 3D printed parts, implemented in the production line based in Poka-Yoke solution, has helped overcoming claims related to montage in wrong positions, length error and incorrect orientation of the products.

Keywords: *3D printing, assembly lines, increased productivity, Poka-Yoke*

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1. INTRODUCTION

Product quality is a major concern in today's modern production systems. Poor quality products decrease customer satisfaction, reduce efficiency, and increase the cost of business operation. It is important to dig out the root causes and eliminate the variance in the production line[1][2]. The traditional way of solving assembly and maintenance problems is to spend a lot of time and money for training and instructing workers what not to do. But when people leave the company, they take their experience and knowledge with them and the assembly difficulties stay behind. One way to find clues for solving assembly problems comes from examining their source and spotting the trouble ahead of time[3]. Poka-yokeas a quality assurance technique developed by Japanese manufacturing engineer Shigeo Shingo comes from the Japanese words 'poka' (inadvertent mistake) and 'yoke' (prevent).It deals with "fail-safing" or "mistake-proofing"[4]. Poka-yoke is also an essential process component of Motorola's Six Sigma strategy[5][6]. It is started in Japanese organisations to implement a zero quality control (ZQC). One of the elements of implementing the principle of ZQC is the Poka-yoke method[7][8][9].

PARAMETERS OF PIPE NARROWING BY RADIAL FORGING WITH INNER THREAD TIGHTENING

PARAMETRI SUŽAVANJA CIJEVI RADIJALNIM KOVANJEM SA UKIVANJEM UNUTARNJEG NAVOJA

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Himzo Đukić


Mirna Nožić

ABSTRACT:
The paper presents experimental results of pipe narrowing by radial forging, with simultaneous tightening of the internal thread. The workpieces are intended for the most responsible elements in aviation. The paper gives expressions for the calculation of: number of passes, dimensions by phases, dimensions of mandrels, expected values of thickening, inner diameter of the pipe and optimal values of the degree of deformation.

Keywords: *pipe narrowing, radial forging, narrowing parameters, internal thread twisting, fiber twisting*

REZIME:
U radu su dati eksperimentalni rezultati sužavanja cijevi radijalnim kovanjem, uz istovremeno ukivanje unutarnjeg navoja. Predmeti su namjenjeni najodgovornijim elementima u vazduhoplovstvu. U radu su dati izrazi za proračun: broja prolaza, dimenzija po fazama, dimenzija trnova, očekivane vrijednosti zadebljanja, unutrašnjeg prečnika cijevi i optimalne vrijednosti stepena deformacije.

Keywords: *sužavanje cijevi**,** radijalno kovanje, parametri sužavanja, ukivanje unutarnjeg navoja**,** uvijanje vlakana*

QUALITATIVE AND QUANTITATIVE YIELD SAWN LOGS OF EUROPEAN BEECH ON DIFFERENT METHODS
KVALITATIVNO I KVANTITATIVNO ISKORIŠTENJE TRUPACA EUROPSKE BUKVE KOD RAZLIČITIM METODA PILJENJA

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S. Smajić


J. Jovanović


J. Ištvanić


M. Obućina

ABSTRACT:
Processing of beech sawmill logs on sawmill machines is possible by applying different sawing methods. Different types live sawing, cant or round sawing are the most commonly used processing methods in sawmilling. This paper presents the research of differences in quantitative and qualitative yields, and structure of sawn timber and residues.Sawmill logs that were processed (120 pieces) were 36-45 cm in diameter and 4 m long. Thicknes of elements which were sawn was 36mm and 56mm. Quantitative yield in cant was 57.14%, in live sawing it was 53.79%, and in round saw it was 57.92%.The most sawn timber and the largest amount of the most valuable assortments were obtained by cant. The best quality of assortments was obtained by round sawing. Lower timber and smaller quantity of products were found in live sawing than in other two methods. Live sawing has resulted in more small assortments than with other sawing methods. In all three ways of sawing, sawdust of tangential texture was obtained the most, followed by semi-radial texture, while radial texture was the least. ....
***Keywords**:European Beech (Fagus sylvatica L.),Sawmilling,Quantity yield, Quanlity yield, Logs*

SAŽETAK:
Prerada bukovih pilanskih trupaca na pilanskim strojevima moguća je primjenom različitih načina piljenja. Različiti tipovi prizmiranja, piljenja u cijelo ili kružnog piljenja su najčešće korišteni načini prerade u pilanskim pogonima. Cilj ovog rada i istraživanja jeste utvrditi utjecaj primarnog piljenja na kvantitativno i kvalitativno iskorištenje sirovine, kao i strukturu dobijenih elemenata.Pilanski trupci koji su obrađivani (120 komada) bili su promjera 36-45 cm, dužine 4m. Piljeni su elementi namjenskih debljine 36mm i 56mm. Kvantitativno iskorištenje kod prizmiranja iznosilo je 57,14 %, pri piljenju ucijelo 53,79 %, a pri kružnom piljenju iznosilo je 57,92 %, Prizmiranjem je dobiveno najviše piljene građe i najveća količina najvrjednijih sortimenata. Kružnim je piljenjem dobivena najbolja kvaliteta sortimenata. Piljenjem ucijelo nastalo je najviše sitnih elemenata. Kod sva tri načina piljenja najviše je dobijeno piljenice tangencijalne teksture, zatim, poluradijalne teksture, dok je radijalnih bilo najmanje. Piljenje ucijelo je dalo najlošije iskorištenje. ....
***Ključne riječi**:Europska bukva, piljenje, kvantitativno iskorištenje, kvalitativno iskorištenje, trupci*

SIMULATION ANALYSIS OF UNDERGROUND COAL MINE VENTILATION SYSTEMS FAILURE

SIMULACIONA ANALIZA OTKAZA VENTILACIONIH SISTEMA PODZEMNIH RUDNIKA UGLJA

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Edisa Nukić


Edin Delić

ABSTRACT:
This research focuses on the actual issue of possibility of predicting, visualizing and monitoring potential conditions of ventilation systems in failure with the aim of efficient situation management and ensuring conditions for saving human lives. Based on results of field measurements and laboratory analyzes, a model was developed for computer simulation of the contaminant distribution and changes in ventilation parameters with Hardy-Cross method using the VnetPC software package and the CFD software package "Fluent". Simulation analysis of ventilation systems failure mechanism identified ventilation branches that failed in cases of simulated hazards, determined the air flow, pressure losses, temperature, methane concentration and general distribution of contaminants and their intensity in individual branches of the ventilation system. The simulation analysis proposed in this paper enables testing of different scenarios for potential hazards as well as prediction of secondary ventilation system failures.

Keywords: *underground coal mines, ventilation system, simulation analysis, VnetPC, Fluent*

REZIME:
Predmetno istraživanje fokusira aktuelno pitanje mogućnosti predviđanja, vizualizacije i praćenja mogućih stanja ventilacionih sistema u otkazu s ciljem efikasnog upravljanja situacijom i osiguranja uslova za očuvanje ljudskih života. Na osnovu rezultata terenskih mjerenja i laboratorijskih analiza urađen je model za računarsku simulaciju procesa distribucije kontaminata, te promjene ventilacionih parametara primjenom Hardy-Cross metode koristeći programski paket VnetPC i CFD programski paket „Fluent“. Simulacionom analizom mehanizma nastanka otkaza ventilacionih sistema identifikovani su ventilacioni ogranci koji su u otkazu za slučajeve simuliranih opasnosti, utvrđen je način strujanja vazduha, gubitci pritiska, temperature, koncentracije metana i generalno distribucija kontaminata i njihov intenzitet u pojedinim ograncima ventilacionog sistema. Simulaciona analiza predložena u ovom radu omogućava testiranje različitih scenarija za potencijalne opasnosti kao i predviđanje sekundarnih otkaza ventilacionog sistema.

Ključne riječi: *podzemni rudnici uglja, ventilacioni sistem, simulaciona analiza, VnetPC, Fluent*

ROLLING BALL SCULPTURE AS A MECHANICAL DESIGN CHALLENGE
SKULPTURA S KOTRLJAJUĆOM KUGLICOM KAO IZAZOV MEHANIČKOG DIZAJNA

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Bosnia and Herzegovina


Alma Žiga *Đerzija Begić-Hajdarević*

ABSTRACT:
Rolling ball sculpture, even the simple one, can be viewed as mechanical design challenge. If sculpture is made of poplar plywood, then bending and twisting of track causes stresses which can destroy rails of track. Another aspect is kinematic and dynamics of rolling ball. Sections of track where the rails is closer together will cause the ball to roll faster, but the ball is more likely to fall off the track. Centripetal force, acting on the ball on spiral path, increases own intensity with square of velocity and might cause ball to fall off. All these aspects will be analyzed in the paper.

Keywords: *rolling ball sculpture, stress analysis in plywood semicircle console, kinematic and dynamics of ball rolling on a track.*

SAŽETAK:
Skulptura s kotrljajućom kuglicom, čak i vrlo jednostavna, može se posmatrati kao izazov mehaničkog dizajna. Ako je skulptura napravljena od šperploče topole, uvijanje i savijanje staze za kuglice stvara napone koji mogu razoriti tračnice staze. Još jedan aspekt je kinematika i dinamika kotrljajuće kuglice. Dijelovi staze u kojima su tračnice bliže uslovit će brže kotrljanje kuglice, ali je veća vjerovatnoća da će kuglica pasti sa staze.Centripetalna sila, koja djeluje na kuglicu na spiralnoj putanji, povećava svoj intenzitet s kvadratom brzine i može usloviti iskakanje kuglice. Svi ovi aspekti analizirat će se u radu.

Ključne riječi: *interaktivna kutija za donacije, kotrljajući novčić, očuvanje momenta količine kretanja.*

SUPPLEMENT TO THE STANDARD VDI/DGQ 3442 WITH GAGE R&R STUDY

DODATAK STANDARDU VDI/DGQ 3442 SA STUDIJOM PONOVLJIVOSTI I REPRODUKTIVNOSTI MERILA

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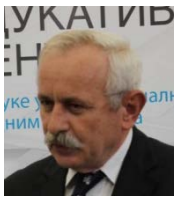
University of Novi Sad, Faculty of Technical Sciences, Department of Production Engineering, 21000 Novi Sad, Serbia


B. Štrbac


M. Ranisavljev


M. Zeljković


M. Knežev


M. Hadžistević

ABSTRACT:
Due to strict functional product requirements designers are compelled to create products with very tight tolerances. Therefore, strict requirements are set for production and measurement processes with regard to accuracy. This research is based on the application of the VDI/DGQ 3442 standard for the assessment of accuracy of numerical control machine tools.The standard is supported by the study of repeatability and reproducibility of the measuring instrument with the aim of dividing total variability of results into the measuring instrument variability and production variability. This is a way to avoid the complex procedure for assessing measurement uncertainty of the CMM used in the verification procedure.

Keywords: *accuracy machine tools, Measurement system analysis, GR&R, CMM.*

REZIME:
Zbog strogih funkcionalnih zahteva proizvoda projektani su prinuđeni da projektuju proizvode sa veoma uskim tolerancijama. Stoga se pred proizvodne procese i procese merenja postavljaju strogu zahtevi u pogledu tačnosti. Ovo istraživanje se temelji na primeni standarda VDI/DGQ 3442 za ocenu tačnosti numeričkih mašina alatki. Standard je podpomognut sa studijom ponovljivosti i reproduktivnosti mernog instrumenta u cilju rastavljanja ukupne varijabilnosti u rezultatima merenja na varijabilnost mernog instrumenta i varijabilnost proizvodnje. Na ovaj način se želi izbeći složena procedura određivanja merne nesigurnosti koordinatne merne mašine korišćenje u verifikaciji..

Ključne reči: *Tačnost mašina alatki, analiza mernih sistema, ponovljivost i reproduktivnost merila, KMM*

3D PRINTING SOLUTIONS IN THE FIGHT AGAINST COVID-19 PANDEMIC

3D ŠTAMPANA RJEŠENJA U BORBI PROTIV COVID-19 PANDEMIJE

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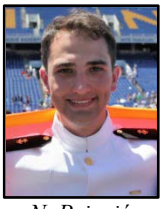
M. Đukanović


M. Jovanović


N. Pejović


D. Lutovac

ABSTRACT:
The global pandemic, caused by COVID-19, brought the whole world to its knees in 2020. Medical systems worldwide succumbed due to the disease outbreaks while healthcare workers have been fighting at the forefront. Medical supplies were running out in many countries and countless lives were lost because of it. Engineers, inventors, and creators from around the world have teamed up to help this cause through 3D printing solutions. It is additive manufacturing that became a leading light in the fight against the COVID-19 as a go-to method in case of medical supply shortages.

Keywords: *3D printing, COVID-19, solutions, respirators, ventilators, face masks, face shields, spare parts*

REZIME:
Globalna pandemija, izazvana COVID-19 virusom, bacila je čitav svijet na koljena 2020. godine. Medicinski sistemi širom svijeta su podlegli zbog izbijanja bolesti dok su se zdravstveni radnici borili na prvoj liniji fronta. U mnogim zemljama nestajalo je medicinskih sredstava i zbog toga je izgubljeno nebrojeno života. Inženjeri, pronalazači i stvaraoci iz cijelog svijeta udružili su se kako bi pomogli rešavanju ovog problema kroz 3D štampana rješenja. Aditivna proizvodnja je postala vodeće svjetlo u borbi protiv COVID-19 kao prelazna metoda u slučaju nedostatka medicinske opreme.

Ključne riječi: *3D štampa, COVID-19, rješenja, respiratori, ventilatori, maske za lice, štitovi za lice, rezervni djelovi*

THE ELECTRO-PNEUMATIC SYSTEM AS A CYBER - PHYSICAL SYSTEM: THE CONCEPT
ELEKTRO-PNEUMATSKI SISTEM KAO KIBERNETSKO - FIZIČKI SISTEM: KONCEPT

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Elvis Hozdić *Zoran Jurković*

ABSTRACT:
The implementation of the new industrial revolution named - Industry 4.0 depends on a series of new and innovative technological achievements, most of which are applied in manufacturing domain. Progress in the field of information-communication technology (ICT), especially in the field of internet, enabled the development of the new manufacturing system models through the transformation of traditionally isolated, hierarchical structures into open and distributed networked structures.Our personal view on the conception and evolution of manufacturing systems structures from the traditional manufacturing systems towards advanced manufacturing systems, such as the cyber-physical systems (CPS) in the domain of electro-pneumatic systems is presented in this paper.This paper presents the model of the electro-pneumatic system (EPS) in a spirit of the cyber-physical systems. The development of a cyber-physical based EPS model represents an evolution extension of the electro-pneumatic systems from traditional systems ....

Keywords: *connectivity, digitalization, cybernation, cyber-physical systems, electro-pneumatic systems, Industry 4.0*

SAŽETAK:
Implementacija nove industrijske revolucije nazvane - Industrija 4.0 ovisi o nizu novih I inovativnih tehnoloških dostignuća, od kojih se većina primjenjuje u proizvodnoj domeni. Napredak na području informacijsko-komunikacijske tehnologije (ICT), posebno u domeni Interneta, omogućio je razvoj novih modela proizvodnih sistema kroz transformaciju tradicionalnih izoliranih, hijerarhijskih struktura u otvorene i distribuirane umrežene strukture. U ovom radu je predstavljen naš osobni pogled na koncepciju i razvoj struktura proizvodnih sistema od tradicionalnih do naprednih proizvodnih sistema kao što su kibernetsko-fizički sistemi (KFS) u području elektro-pneumatskih sistema. Rad predstavlja model elektro-pneumatskog sistema (EPS) u duhu kibernetsko-fizičkih sistema. Razvoj modela EPS utemeljenog na kibernetsko-fizičkim sistemima predstavlja evolucijski razvoj elektro-pneumatskih sistema od tradicionalnih ….

Ključneriječi: *povezivanje, digitalizacija, kibernetizacija, kibernetsko-fizičkisistemi, elektro-pneumatskisistemi, Industrija 4.0*

MINITAB APPLICATION AS STATISTICAL TOOL FOR LSS

PRIMJENA MINITAB KAO STATISTIČKOG ALATA ZA LSS

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Ismar Alagić

ABSTRACT:
The term "statistical method" is used for a very broad list of quantitative and qualitative methods, some of which have little or even nothing in common with the classical theory of mathematical statistic. Data analysis is only a small part of the research process. Before the application of a certain method, imminent is a full set of activities that are reflected in the design of research and selection of appropriate resources for data collection. Only once the investigation is complete, obtained information should be prepared to enter into a specialized application for data processing (e.g. SPSS or Minitab). When entering data one must be familiar with the work of the selected application and manner of communication of operators with the application. Minitab was created at the State University of Pennsylvania as an expression of the need to improve the teaching of statistics. Currently, Minitab has become one of the most known commercial applications for LSS projects. This article provides proposal a set of approaches that are the basis for the development and application of the Minitab as statistical tool for LSS approach.

Keywords: *Minitab, statistical method, Lean Six Sigma (LSS), software package.*

REZIME:
Pojam "statistička metoda" koristi se za vrlo široku listu kvantitativnih i kvalitativnih metoda, od kojih neke nemaju puno ili čak ništa zajedničko s klasičnom teorijom matematičke statistike. Analiza podataka samo je mali dio procesa istraživanja. Prije primjene određene metode, predstoji čitav niz aktivnosti koji se ogledaju u dizajnu istraživanja i odabiru odgovarajućih resursa za prikupljanje podataka. Tek nakon završetka istrage, pripremljene informacije treba pripremiti za ulazak u specijaliziranu aplikaciju za obradu podataka (npr. SPSS ili Minitab). Prilikom unosa podataka mora biti upoznat sa radom odabrane aplikacije i načinom komunikacije operatora sa aplikacijom. Minitab je nastao na Univerzitetu u Pensilvaniji kao izraz potrebe za poboljšanjem nastave statistike. Trenutno je Minitab postao jedna od najpoznatijih komercijalnih aplikacija za LSS projekte. Ovaj rad daje prijedlog skupa pristupa koji su osnova za razvoj i primjenu Minitaba kao statističkog alata za LSS pristup.

Ključne riječi: *Minitab, statistička metoda, Lean Six Sigma (LSS), softverska aplikacija.*

ANALYSIS OF THE BEHAVIOR OF THE ASH DEPENDING ON THE TEMPERATURE OF COMBUSTION AND AIR SUPPLY SYSTEM

ANALIZA PONAŠANJA PEPELA U ZAVISNOSTI OD TEMPERATURE I NAČINA DOBAVE VAZDUHA ZA SAGORIJEVANJE

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Nihad Hodžić


Anes Kazagić


Kenan Kadić

ABSTRACT
The choice of the appropriate combustion technology is primarily related to the overall physico-chemical properties of fuel, primarily the properties of solid fuel, which also contains a mineral matter. The higher the content of fly ash in the fuel, the more complex the choice of the appropriate combustion technology. In addition to knowledge about the chemical composition of ash and the ash melting temperatures, the choice of combustion technology also requires knowledge about the behavior of ash in this process at different temperatures and technical-technological conditions in the furnace. This paper presents the results of laboratory research on the behavior of fly ash during the combustion of Bosnian coals from Middle Bosnian mining basin, and co-firing coal with waste woody biomass. The research was conducted on reactor installed in the laboratory for coal and biomass combustion at the Faculty of Mechanical Engineering, University of Sarajevo. The test fules powdered were subjected to pulverized combustion with a variable combustion temperature, the excess air ratio and the system of air supply into the reaction zone.
Keywords: *reactor, coal, combustion, ash, slag*

SAŽETAK
Izbor odgovarajuće tehnologije sagorijevanja vezan je ponajprije za ukupne fizičko-hemijske osobine datog goriva, prvenstveno osobina čvrstog goriva koje u svom sastavu ima i mineralni dio (pepeo). Što je sadržaj tog mineralnog dijela u gorivu veći, to je izbor odgovarajuće tehnologije sagorijevanja složeniji. Pri tom izboru tehnologije je, pored poznavanja hemijskog sastava pepela i karakterističnih temperatura tog pepela, od suštinskog značaja imati i saznanja o ponašanju pepela u procesu sagorijevanja pri različitim temperaturnim i tehničko-tehnološkim uvjetima u ložištu. Stoga su u ovom radu, sa tog aspekta ponašanja pepela, predstavljeni rezultati laboratorijskih istraživanja sagorijevanja bosanskohercegovačkih ugljeva iz srednjobosanskog rudarskog bazena zasebno kao i pri kosagorijevanju sa otpadnom drvnom biomasom. Istraživanja su obavljena na odgovarajućem reaktoru instaliranom u laboratoriji za sagorijevanje uglja i biomase u okviru Mašinskog fakulteta Univerziteta u Sarajevu. Sprašena ispitna goriva podvrgnuta su sagorijevanju u letu pri čemu je varirana temperatura sagorijevanja, koeficijent viška zraka za sagorijevanje i način dobave tog zraka u reakcionu zonu.
Ključne riječi: *reaktor,ugalj, sagorijevanje, pepeo, šljaka*

THE APPLICATION OF DMAIC LSS METHODS IN ASSEMBLY TECHNOLOGY DESIGN OF FILTER W1022/LE19172

PRIMJENA DMAIC LSS METODA U PROJEKTOVANJU TEHNOLOGIJE MONTAŽE FILTERA W1022/LE19172

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Ismar Alagić

ABSTRACT:
Rapid development of market imposes commitment to companies to introduce constant improvements in their systems and makes them train their experts in order to be competent for establishment of new methods in the area of quality improvement process. Improvement of the process became an important feature in gaining an advantage over the competition. In the race for higher profits and survival in the age of world's crisis, there is no money available and time for improvement is less and less, and that is why new ideas are needed. The answer on new circumstances imposed by the market can be found in Lean Six Sigma concept. Lean Six Sigma concept requires changes and constant improvements.Application of DMAIC Lean Six Sigma methods in industrial conditions manufacturing of filter W 1022/ LE 19172 in company Mann Hummel BA from Tešanj is shown in this article. Obtained results are of practical importance, especially in the field of filters design and assembly technology designing of filters.

Keywords: *Lean Six Sigma (LSS), DMAIC, filter, assembly technology.*

REZIME:
Brzi razvoj tržišta nameće predanost firmama da uvode stalna poboljšanja u svoje sisteme i tjera ih da obučavaju svoje stručnjake kako bi bili kompetentni za uspostavljanje novih metoda u području procesa poboljšanja kvaliteta. Poboljšanje procesa postalo je važna karakteristika sticanja prednosti nad konkurencijom. U trci za većim profitom i opstankom u doba svjetske krize nema novca, a vremena za poboljšanje je sve manje i zato su potrebne nove ideje. Odgovor na nove okolnosti koje tržište nameće može se naći u konceptu Lean Six Sigma. Koncept Lean Six Sigma zahtijeva promjene i stalna poboljšanja. Primjena metoda DMAIC Lean Six Sigma u industrijskim uslovima izrade filtera W 1022 / LE 19172 u firmi Mann Hummel BA iz Tešnja prikazana je u ovom radu. Dobijeni rezultati su od praktične važnosti, posebno na polju projektovanja filtera i tehnologije montaže filtera.

Ključne riječi: *Lean Six Sigma (LSS), DMAIC, filter, tehnologija montaže.*

OBJECT CLASSIFICATION IN ANINTELLIGENT ROBOTIC CELL USING DEEP LEARNING
KLASIFIKACIJA OBJEKATA U INTELIGENTNOJ ROBOTSKOJ ĆELIJI KORIŠTENJEM DUBOKOG UČENJA

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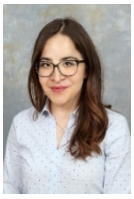
[2]DKR German Center for Robotics, Tuzla 75000, Bosnia and Herzegovina

Lejla Banjanovic – Mehmedovic



Azra Gurdić

ABSTRACT:
The increased development of robotics, artificial intelligence, Internet of Things and other technologies have made the transition to a new era – Industry 4.0. The main goal of Industry 4.0 is to create a better-connected manufacturing system, where humans and robots can work together while maximizing safety, incomes and daily production rate. Industry 4.0 requires the integration of different types of technologies, such as AI, robotics and computer vision, resulting in a powerful manufacturing system with the possibility of being used in any application. Such system is proposed in this paper, where an experimental platform of an intelligent robotic cell is shown. The deep learning classification results show great impact on new trends in Industry 4.0 solutions.

Keywords: *Classification, Deep Learning, Smart Manufacturing, Industry 4.0*

SAŽETAK:
Ubrzan razvoj robotike, vještačke inteligencije, Interneta stvari i drugih tehnologija uzrokovolo je traniziciju u jednu potpuno novu eru – Industriju 4.0. Glavni cilj Četvrte industrijske revolucije je kreiranje bolje povezanih proizvodnih sistema, gdje ljudi i roboti mogu raditi rame uz rame uz maksimalnu sigurnost, porast prihoda i dnevne stope proizvodnje. Industrija 4.0 zahtjeva integraciju različitih tehnologija kao što su vještačka inteligencija, robotika i kompjuterksa vizija koje rezultuju u nastanku moćnih proizvodnih sistema za različite primjene. Upravo jedan takav sistema je prikazan u ovom članku, gdje je data eksperimentalna platforma inteligentne robotske ćelije. Rezultati klasifikacije pomoću dubokog učenja pokazali su da mogu imati veliki uticaj na trendove Četvrte industrijske revolucije.

Ključne riječi*: Klasifikacija, Duboko učenje, Pametna proizvodnja, Industrija 4.0*

PROCEDURAL CONTENT GENERATION OF CUSTOM TOWER DEFENSE GAME USING GENETIC ALGORITHMS

GENERIRANJE PROCEDURALNOG SADRŽAJA PRILAGOĐENEIGRE TOWER DEFENSE KORIŠĆENJEM GENETSKIH ALGORITMA

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V. Kraner


I. Fister Jr.


L. Brezočnik

ABSTRACT:
In the present day, it is difficult to imagine the development of computer games without the use of artificial intelligence. We see it utilized for gameplay, players modeling, playtesting, or content generation. In this paper, we focused on the content generation of a custom Tower Defense game named Save the Sheep. The Tower defense game is a strategic game, which was, in our case, proposed in a non-violent way. We generated key building blocks of the game with a genetic algorithm, i.e., a game map, unit placement, and a waves system. The final Tower Defense inspired game was implemented in the Unity game engine. The results show that by applying genetic algorithms, it is possible not only to generate content that makes the game more complex, but also more challenging and interesting for players.

Keywords:*Evolutionary algorithms, Genetic algorithm, Procedural content generation, Tower Defense*

SAŽETAK:
U današnje je vrijeme teško zamisliti razvoj računarskih igara bez upotrebe umjetne inteligencije. Vidimo da se koristi za igranje, modeliranje igrača, testiranje igara ili generiranje sadržaja. U ovom radu usredotočili smo se na generiranje sadržaja prilagođene igre Tower Defense nazvane Save theSheep. Igra Tower Defence je strateška igra koja je, u našem slučaju, predložena na nenasilan način. Generirali smo ključne blokove igre s genetskim algoritmom, tj. mapom igre, smještajem jedinica i sustavom valova. Konačna igra inspirisana Tower Defense igrom implementirana je uUnity game engine. Rezultati pokazuju da je primjenom genetskih algoritama moguće generirati sadržaj koji igru čini ne samo složenijom, već i izazovnijom i zanimljivijom za igrače.

Ključne riječi: *Evolucijski algoritmi, Genetski algoritmi, Generiranje proceduralnog sadržaja, Tower Defense*

INDUSTRIAL REVOLUTION AND EMPLOYEE MOTIVATION EVOLUTION

INDUSTRIJSKA REVOLUCIJA I EVOLUCIJA MOTIVACIJE ZAPOSLENIH

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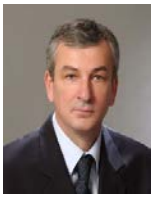
M. Bičo Ćar


M. Šestić


S. Stupar


E. Kurtović

ABSTRACT:
Industry 4.0 is a new paradigm that radically changes the life of modern man as a whole and gives shape to our near future. This impact is reflected in all spheres of modern society, from the mode of production and everything related to production, through the use and consumption of goods and services, communication, social relations, to access to employee management as a key element of any economy. In view of this, this paper deals with the specifics of I 4.0, employee performance characteristics and employee motivation in Industry 4.0, showing the evolution of the approaches used to motivate employees during previous industrial epochs.

***Keywords**: industrial revolution, I 4.0, work, employees, motivation to work*

SAŽETAK:
Industrija 4.0 je nova paradigma koja iz korijena mijenja život savremenog čovjeka u cjelini i daje obrise našoj bliskoj budućnosti. Ovaj uticaj se ogleda u svih sferama savremenog društva počev od način proizvodnje i svega što je u vezi sa proizvodnjom, preko korištenja i potrošnje dobara i usluga, načina komunikacije, socijalnih odnosa, do pristupa upravljanju zaposlenima kao ključnim elementom svake privrede. Obzirom na to, ovaj rad se bavi specifičnostima I 4.0, karakteristikama rada zaposlenih i motiviranjem zaposlenih u industriji 4.0, sa prikazom evolucije pristupa korištenih za motiviranje zaposlenih tokom prethodnih industrijskih epoha.

***Ključne riječi**: industrijska revolucija, I 4.0, rad, zaposleni, motivacija za rad*

TIME SERIES PREDICTION IN SOFTWARE – DEFINED NETWORK USING DEEP LEARNING
PREDVIĐANJE VREMENSKE SERIJE U SOFTVERSKI UPRAVLJANOJ MREŽI POMOĆU DUBOKOG UČENJA

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Jasenko Topic


Lejla Banjanovic – Mehmedovic


Suad Kasapovic

ABSTRACT:
This paper presents the results of the study on time series prediction possibilities for acquired traffic bandwidth data in a software-defined network (SDN), by using a deep learning (DL) system in form of a recurrent neural network (RNN). Researching the tuning of RNN hyperparameters the paper examined time window for time series past data, batch size of analysed data, as well as time window for prediction of time series values in the future, number of epochs and lastly, steps per epoch for an RNN training process. Further, for an SDN simulation a Mininet emulator and an OpenDaylight SDN controller was used. An RNN was implemented in Keras application programming interface for Google TensorFlow machine learning (ML) platform. It was confirmed that RNNs present a significant alternative to traditional stochastic models for time series prediction.
Keywords: *deep learning, Keras, prediction, recurrent neural network, software-defined network, time series*

SAŽETAK:
U radu su prikazani rezultati istraživanja mogućnosti predviđanja vremenske serije za snimljeni saobraćaj u softverski definiranoj računarskoj mreži (SDN), korištenjem sistema dubokog učenja (DL) u obliku povratne neuronske mreže (RNN). Istraživajućipodešavanjehiperparametara RNN, u radu su razmatrani broj vremenskih koraka posmatranja vremenske serije u prošlosti, veličina analiziranog skupa podataka, kao i broj vremenskih koraka predviđanja vrijednosti u budućnosti,broj epoha i na kraju, broj koraka po epohi treniranja RNN. Dalje, za simulaciju SDN korišteni su Mininet emulator i OpenDaylight SDN kontroler. RNN implementiranaje u Keras sučelju za programiranje aplikacija za Google TensorFlow platformu za mašinsko učenje (ML). Potvrđeno je da RNN predstavljaju značajnu alternativu tradicionalnim stohastičkim modelima za predviđanje vremenske serije.
Ključneriječi: *duboko učenje, Keras, predviđanje, povratna neuronska mreža, softverski upravljana mreža, vremenska serija*

DISTURBANCE OBSERVER BASED CONTROL OF SHUNT ACTIVE POWER FILTER

PRIMJENA OBSERVERA SMETNJE U UPRAVLJANJU AKTIVNOG FILTERA SNAGE

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Sevkuthan Kurak[1]

ABSTRACT:
In recent years, governments and manufacturers have been focusing on “energy quality standards”. The main objective is to prevent degradation of voltage-current levels due to harmonics and low power factor. Active Power Filters (APF) are energy quality devices to mitigate the before mentioned issues. This paper presents disturbance observer-based current control of three-phase APF. A three-phase power diode rectifier with resistive load was taken as the balanced nonlinear load. The modelling is based on the ABC-DQ transformation of the AC-system variables. The reference currents to be used by the current controllers extracted according to DQ-Theory. In the study, measured and calculated terms are substituted by using a disturbance observer, DOB. Thus, parameter independent control structure is obtained. The voltage level of the DC-side is regulated by using a PI controller. Simulation results for the constant, variable, reactive load tests and variable grid frequency test confirm the performances considered theoretically for the APF topology.

Keywords: *Active Power Filtering, Disturbance Observer*

REZIME:
U posljednje vrijeme vlasti i proizvodjaći su fokusirani na “energetske standarde“ u korištenju električne energije. Glavni cilje je spriječiti uticaje viših harmonika i niskog faktora snage na kvalitet isporučene električne energije. Aktivni Filteri Snage (APF) su uredjaji koji se koriste za smanjenje gorenavedenih uticaja. Ovaj članak prikazuje upravljanje trofaznog APF na bazi primjene observera smetnje. Tofazni diodni ispravljač je uzet kao nelinearno opterećenje. Model je baziran na ABC-DQ transformaciji naizmjeničnih varijabli. Referentne struje su odredjene korištenjem DQ-teoriju. Dinamičko razvezivanje je ostvareno korištenjem observera smetnji (DOB). Na taj način je realizirana struktura upravljanja koja ne zavisi od parametara sistema. Napon na DC strani je upravljan korištenjem PI regulatora. Rezultati simulacije za konstantno, promjenljivo i reaktivno opterećenje te za promjenljivu frekvenciju mreže potvrdjuju performanse koje su predvdjene na bazi teoretske analize APF.

Ključne riječi: *Aktivni Filteri Snage, Primjene Observera Smetnje*

INFORMATION TECHNOLOGY FOR IMPLEMENTATION THE FUNCTIONAL MODELING OF A TECHNICAL OBJECT

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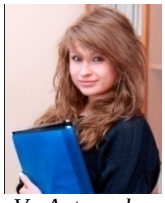
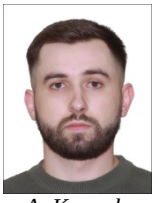

V. Antypenko


V. Nenia


A. Marchenko


B. Antypenko


A. Kovpak

ABSTRACT:
This article presents the information technology of functional modeling for technical objects of various complexities providing the implementation of different levels of the detailed objects description. It also supports the methodology for practical realization the function of designed object by selecting the technical device and its components. Function detailing is carried out by introducing simpler functions which are combined sequentially, in parallel and combined. Herewith, the block of functions belonged to a certain level is performed as a unit. Its execution provides the implementation of a higher level function, which is detailed by this block. The function decomposition is considered complete if its purpose is confirmed by the results of structural and parametric synthesis. The fundamental element of the offered information technology is a relational database, main table of which stores data on composition of each function and its subordination within the tree structure of the functions description. Depending on the designer's preferences, the formation of the major part can be performed in three ways by using the text dialogue directly in the table, the graphical dialogue while forming or editing a topological scheme of decomposition the higher level function or the textual form of the function analytical representation.

Keywords: *functional modeling, technical object, information technology, relational database, tree structure, detailed description, function decomposition, function description.*

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1. INTRODUCTION

Nowadays the emergence of smart objects or cyber-physical systems is not unusual. On the contrary, when a consumer analyzes any thing for own use, he or she considers the properties of the object. For instance, how it can adapt to changes in the environment, respond to user commands and take into account the values of current parameters, perform self-diagnosis and provide advance information on possible problems, etc.It is clear that the number of such properties will continue to increase and they will be constantly improved.

ANALYSIS OF X-RAY IMAGES OF THE LUNGS USING A NEURAL NETWORK

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O. Pronina


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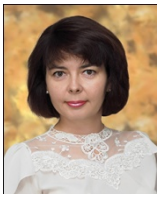
O. Piatykop

ABSTRACT:
The study presents a model for diagnosing lung disease based on a convolutional neural network model. This model, using the deep learning method, is the basis of the software for the diagnosis of lung diseases using x-rays. The architecture of the neural network is described, as well as the stages of preparing data for its training and verification. The process of increasing the sample of data for training is described, which subsequently allows us to solve the problem that the input data is not of a standard form. The results of experiments are presented to determine the most effective parameters of the developed neural network.

Keywords: *convolutional neural network, lung disease diagnostic model, x-rays of lungs, binary classification*

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1. INTRODUCTION

In the modern world, information technology is actively used in all spheres of human activity. Thanks to existing improvements, information technologies are used in various fields of medicine. Currently, research is mainly aimed at modeling parts of the human body and recognizing diseases as a result of various scans (for example, cardiograms, CAT scans, ultrasound scans, etc.).

One of the branches of medicine where the use of information technology is necessary is decrypted x-rays. This is true because in the current era of development, humanity still suffers from a late diagnosis of pulmonary diseases.

Over the past decades, computer diagnostic systems have been developed to extract useful information from x-rays to help physicians quantify. The most productive image recognition method is neural networks. Since neural networks are good to use for recognition of diseases using scanning. This is due to the fact that there is no need to provide a specific algorithm for determining the disease.

The aim of the work is to create a model for the diagnosis of lung diseases using x-rays using a neural network using the deep learning method.

WASTE MANAGEMENT SYSTEM AUTOMIZED THROUGH IOT

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I. Tafaj


A. Lala


R. Kushe


E. Kotobelli

ABSTRACT:
This article explains the basic of Internet of Things (IoT) and the most used technologies to connect smart objects to each other. More and more smart objects are being created which then get implemented with the right sensors (wireless) and can communicate with other smart objects. It has been deducted already that a way for efficient waste management continues to be missing in our daily life on smart city applications. And that is why this application, This System needs to be developed to improve the whole collection of waste in smart cities, to increase efficiency and effectiveness, to reduce the cost and shorten the processing time, for having and managing a clean smart city.

Keywords*: Internet of Things (IoT), Smart City, Arduino, Cloud Data Storage, IP Based Sensors.*

---

1. INTRODUCTION

Through-out history ever since in their beginning humans has always sought improvement. Whenever its wars or city developments or looking and creating new resources to consume or upgrading our technology us humans have never stopped to seeking the best and more efficient ways to do a certain type of task. In this article we will focus on technology and more specifically on IOT(Internet of things). But what is it, what Internet of Things (IoT) does is that through "smart objects" like cars, house devices (air conditioners or refrigerators, and way more devices that we can think off in our daily lives, and through the wireless network it connects them, and makes them share and coordinate information? [1,2]

As Cited by L. Lee and K. Lee [3] The areas of impact when it comes to IOT systems include manufacturing, home automation transportation, healthcare and many more. Internet of Things could play a great role in improving the standard of life and growing the world’s economy. More and more smart objects are being created which then getimplemented with the right sensors and can communicate with other smart objects.By doing so, they share data with other members of the system through wired or wireless networks [3, 4].

SECURITY OF AUTOMATED TELLER MACHINES (ATM's)

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ABSTRACT:
ATM-s are the tools that perform cash transactions anddifferentbanking operations,as they containandperform sensitive data of customers. Differently fromthe past,where attackers were focusedon physical attacks,nowadays theyuse logicalattacks tocapture those sensitive data orto gain access to cash inside ATMs.In thispaperwe have assessed risk on an ATM platform to beaware of risks that come fromlogical attacks. Through this risk assessmentwe have pointedoutsome importantissues thatare responsible for vulnerabilities of ATMs platform. In this paper,we have also discussedthe possible countermeasures to mitigatethe riskand provideasecure environment on banks andATM's.

Keywords: *ATMs, logicalattacks, risk assessment, countermeasures, secure environment.*

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1. INTRODUCTION

ATMs have been first used in 1930s, but when they really bring a new revolution on banking environments were in 1960s. Nowadays, three million ATMs all over the world are performing on Windows Operating System. ATMs through the OS communicate with peripheral devices and their drivers. Also, to ensure communication in the network of bank ATMs use the Internet Protocol, which make it visible that ATMs are part of the network as result part of the internet itself. The fact that ATMs contain a considerable amount of cash to perform daily operations and being part of the network, make them an attractive target for thieves. Attackers are not only interested to thieve cash but more important fort them is to gain access on sensitive data that are meaningful and guide them to full bank transactions. It is very important to realize risk assessment as it provides information to select the right countermeasures and controls for mitigating the impact of risk.

In this paper, we have been concentrated on logical risks. Firstly, we will give an overview of attacks on ATMs and the appropriate countermeasures for each of them.

COMB-BASED DECIMATION FILTER WITH IMPROVED ALIASING REJECTION IN ALL FOLDING BANDS

FILTER DECIMADOR SA ČEŠLJASTIM FILTROM KAO BAZOM SA POBOLJŠANOMFREKVENTNOM KARAKTERISTIKOM U OBA OPSEGA PROPUSNOM I NEPROPUSNOM

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G. Jovanovic-Dolecek I. Karabegović

ABSTRACT:
This paper presents a novel comb-based decimation filter with an improved magnitude characteristic. The filter has two stages with the decimation factors M/2 and ½, respectively. The corrector filter, previously proposed in literature, is placed into the second stage. This filter simultaneously improves comb passband droop and alias rejection in odd folding bands. However, comb alias rejection is not improved in even folding bands. We propose here to insert a simple modified comb filter into the first stage to improve magnitude characteristic of the comb-corrector based decimation filter, in all folding bands. The method is illustrated with two examples. The comparisons with some similar methods from literature, are also presented, in order to prove the superiority of the proposed design.

Keywords: *decimation, aliasing, comb filter, passband droop, multiplierless desig, corrector filter*

REZIME:
U radu je prikazan novi decimator filter sa poboljšanom frekventnom karakteristikom. Filter ima dvije etape sa faktorima decimacije, na prvoj i drugoj etapi, respektivno, jednakim M/2 i ½. Filter korektor, koji je ranije predloženog u literaturi, je postavljen u drugu etapu. Ovaj filter istovremeno poboljšava propusni i parne nepropusne opsege češljastog filtera. Ovdje je predloženo da se u prvu etapu ubaci jednostavan modifikovani češljasti filter sa ciljem da se poboljša frekventna karakteristika u svim nepropusnim opsezima. Metod je ilustrovan sa dva primjera. Uporedjivanje sa slicnim metodama u literaturi pokazuju prednosti predloženog filtera.

Ključne riječi: *decimacija, alijasing, češljasti filter, pad u propusnom opsegu, dizajn bez množača, korektor filter*

THE IMPORTANCE OF MACHINE LEARNING IN INTELLIGENT SYSTEMS

ZNAČAJ MAŠINSKOG UČENJA U INTELIGENTNIM SISTEMIMA

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M. Bičo Ćar


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ABSTRACT:
The modern business environment is almost impossible to imagine without the support of the most sophisticated information technologies, such as intelligent systems. A large number of intelligent systems, such as Artificial Neural Networks, Expert Systems and Genetic Algorithms, are intended to solve predominantly unstructured problems of high level of complexity, which cannot be solved by conventional programming methods. These intelligent systems use an approach that mimics certain processing abilities possessed by the human brain. One of the most important abilities of human intelligence is learning, from one's own and others' experience, which results in recognizing patterns based on experiences. The technology that allows computers to possess this ability is called Machine Learning. The aim of this paper is to unify and systematize some basic knowledge about machine learning, and explain the concept of machine learning, generic algorithms on which it is based, types of machine learning, and the importance of applying this technology in intelligent systems.
Keywords: *Artificial Intelligence, Machine Learning, Machine Learning Algorithms, Intelligent Systems, Supervised Learning, Unsupervised Learning*

SAŽETAK:
Savremeno poslovno okruženje, gotovo je nemoguće zamisliti bez podrške najsofisticiranijih informacionih tehnologija, kakvi su inteligentni sistemi. Veliki broj inteligentnih sistema, kao Vještačke neuronske mreže, Ekspertni sistemi i Genetički algoritmi, namijenjeni su rješavanju pretežno nestrukturiranih problema visokog nivoa složenosti, koji se ne mogu rješavati kovencionalnim metodama programiranja. Ovi inteligentni sistemi koriste pristup koji imitira određene sposobnosti obrade koje posjeduje ljudski mozak. Jedna od najvažnijih sposobnosti ljudske inteligencije jeste učenje, iz vlastitog i tuđeg iskustva, što rezultira prepoznavanjem obrazaca zasnovanih na iskustvima. Tehnologija koja omogućava da ovu sposobnost posjeduju i računari zove se Mašinsko učenje. Cilj ovog rada je objediniti i sistematizovati neka osnovna znanja o mašinskom učenju, te objasniti koncept Mašinskog učenja, generičke algoritme na kojima se ono zasniva, vrste Mašinskog učenja, te značaj primjene ove tehnologije u inteligentnim sistemima.
Ključne riječi: *Vještačka inteligencija, Mašinsko učenje, Algoritmi Mašinskog učenja, Inteligentni sistemi, Nadgledano učenje, Nenadgledano učenje*

USE OF NEURO-FUZZY APPROACH IN ASSESSING THE QUALITY OF KNOWLEDGE

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Rosa Usmanovna Stativko

ABSTRACT:
According to the ideas of the Bologna process, the formation of a single European higher education space is currently ongoing. The common space of higher education implies both the presence of foreign students in higher educational institutions and the obtaining of employment opportunities for graduates of higher educational institutions in the European and world labor market. In connection with the situation, the Russian educational system is faced with the task of developing and supporting the competitiveness of its system of higher professional education. A key element in the system of higher education is a higher educational institution. It is important to determine the position of a higher educational institution in the market of educational services. The purpose of this work is the development of approaches to assess the competitiveness of a higher educational institution. The competitiveness of a higher educational institution is characterized primarily by the quality of educational services. To assess the quality of educational services, the quality of knowledge received by students, it is necessary to solve the problem of determining significant indicators. Assessing the quality of educational services is complicated in that there is an influence of indicators of various nature with varying degrees of influence. In addition, indicators that have an impact can be either numerical or non-numerical in nature. The presence of non-numeric indicators complicates the task. To accomplish the task of assessing the quality of educational services, a study was conducted to identify indicators that have the greatest impact on the quality of the educational process. It was found that the needs of the labor market should be taken into account, the quality of the training technologies used, the quality of the educational and methodological complex used in the educational process, the equipment of classrooms and laboratories, and the quality of the teaching staff. In this paper, an approach is proposed for assessing the quality of students' knowledge, based on the use of a neuro-fuzzy inference system. A set-theoretical model has been formed to describe indicators that affect the quality of students' knowledge. The content of each indicator is disclosed. The proposed approach for constructing a model for assessing the quality of student knowledge allows us to obtain a numerical characteristic.

Keywords: *higher education, a neuro-fuzzy inference system, quality of educational.*

MOBILE APPLICATION MTEMPERATURES

MOBILNA APLIKACIJA MTEMPERATURE

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ABSTRACT:
Mobile application mTemperature (mTemperatures) has purpose to get data of temperatures for selected month, year and city from remote Web site using smartphone. It is written for mobile operating system Android, based on programming language JAVA. The application enables to obtain data of temperatures from 01.2014. to the previous month of current year for cities: Bihać, Mostar, Sarajevo and Zenica.The data can be presented in two forms: tabular and in the form of diagram. The application supports Android from version 25 to the latest.

Keywords: *mobilna aplikacija, podaci, udaljeni Web site, Android.*

REZIME:
Mobilna aplikacija mTemperature je namjenjena za dobivanje podataka o temperaturama za određeni mjesec, godinu i grad sa udaljenog Web site-a pomoću smartphone-a. Napisana je za mobilni operativni sistem Android, koji bazira na programskom jeziku JAVA. Pomoću nje se mogu dobiti podaci o temperaturama od 01.2014. do prethodnog mjeseca tekuće godine za gradove: Bihać, Mostar, Sarajevo i Zenica.Podaci mogu biti prikazani u dvije forme: tabelarno i u formi dijagrama.Aplikacija podržava Android od verzije 25 pa do najnovije.

Ključneriječi: *mobilna aplikacija, podaci, udaljeni Web site, Android.*

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1. INTRODUCTION

Temperature data are very interesting these days. How high are temperatures measured today in comparison to those of previous years? Application mTemperature (mTemperatures) eneables to get temperatures data on a smartphone for the period of time from 01.2014. to previous month current year for B&H cities: Bihać, Mostar, Sarajevo i Zenica. In this way, it can be estimated how the current temperature in a particular city has changed compared to the previous period of time. The data is obtained from the Web site of the application eDijagram [6].

PROVIDING MULTIMODAL TRAVELER INFORMATION CROSS-BORDER JOURNEY PLANNERS APPROACH

PRUŽANJE MULTIMODALNIH PUTNIČKIH INFORMACIJA PRISTUP PREKOGRANIČNIH PUTNIH VODIČA

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Sadko Mandžuka

ABSTRACT:
Travel organization is becoming an increasing challenge in the modern world, both in urban and interregional conditions. It is a consequence of needs to improve the overall efficiency of the transport system, its safety and its neutral impact on the environment. A multimodal approach is emerging as one of the promising solutions. Due to the nature of the organization of transport companies, this is a particularly demanding task in terms of routing cross-border travel. The development of cross - border travel routing based on a distributed approach is presented in the paper.

Keywords: *Multimodal Travel, Travel planners, Cross-border travel, Distributed systems*

SAŽETAK:
Organizacija putničkih putovanja postaje sve veći izazov u suvremenom svijetu. To je posljedica potreba za poboljšanje ukupne učinkovitosti prometnog sustava, njegove sigurnosti i neutralnog utjecaja na okoliš. Multimodalni pristup se nameće kao jedno od rješenja. Zbog karaktera organizacije transportnih tvrtki to je posebno zahtjevna zadaća u uvjetima planiranja prekograničnih putovanja. U radu se daje prikaz dosadašnjeg iskustva u razvoju prekograničnih putnih vodiča zasnovanih na distribuiranom pristupu.

Ključne riječi: *Multimodalno putovanje, Putnički planeri, Prekogranično putovanje, Distribuirani sustavi*

APPLICATION OF MULTILEVEL INTEGRATION MODEL FOR UNMANNED AERIAL VEHICLES IN TRAFFIC INCIDENT MANAGEMENT PROCESSES

VIŠERAZINSKI INTEGRACIJSKI MODEL PRIMJENE BESPILOTNIH LETJELICA U PROCESIMA UPRAVLJANJA INCIDENTNIM SITUACIJAMA U PROMETU

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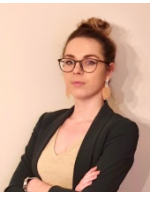
P. Škorput


D. Medić


L. Bukvić

ABSTRACT:
Implementation problem regarding unmanned aerial vehicles in the processes of managing incident situations in traffic is one of the key issues where transport technologies should provide conceptual, strategic, technological and operational-technical solutions. Incident management is a problem of CLIOS (Complex, Large-scale, Interconnected, Open, Sociotehnical) and SOSE (System of Systems Engineering) types, so it is necessary to apply mCLIOS (modificated, Complex, Large-scale, Interconnected, Open, Sociotechnical) methodology. Part of the problem has already been solved at the technical level (of the drone system) so further research is needed to develop higher system levels using an appropriate methodology such as the proposed mCLIOS. The paper presents a multilevel integration model of the application of unmanned aerial vehicles in traffic incident management processes such as the complex SOSE system.

Keywords: *drones, traffic incident management, CLIOS, mCLIOS, SOSE*

SAŽETAK:
Problem primjene bespilotnih letjelica u procesima upravljanja incidentnim situacijama u prometu jedno je od ključnih pitanja na koje prometna stuka treba dati konceptualna, strategijska, tehnologijska i operativno-tehnička rješenja. Upravljanje incidentima je problem tipa CLIOS (engl: Complex, Large-scale, Interconnected, Open, Sociotehnical) i SOSE (engl: System of Systems Engineering) tako da je nužno primjenitimCLIOS (emgl: modificated, Complex, Large-scale, Interconnected, Open, Sociotehnical) metodologiju. Dio problema je već riješen na tehničkoj razini (tehnička razina sustava bespilotnih letjelica) tako da je potrebno provesti daljna istraživanja za razvoj viših sustavskih razina koristeći odgovarajuću metodologiju kao što je predloženi mCLIOS. U radu je o predložen višerazinski integracijski model primjene bespilotnih letjelica u procese upravljanja incidentnim situacijama u prometu kao kompleksni SOSE sustav..

Ključne riječi: *dronovi, upravljanje incidentnim situacijama u prometu, CLIOS, mCLIOS, SOSE*

DESIGN AND DEVELOPMENT OF A HOLONOMIC MOBILEROBOT FOR MATERIAL HANDLINGAND TRANSPORTATION TASKS

PROJEKTOVANJE I RAZVOJ HOLONOMNOG MOBILNOG ROBOTA ZA ZADATKE MANIPULACIJE I TRANSPORTA MATERIJALA

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A. Jokić


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ABSTRACT:
Modern intelligent manufacturing systems are dynamic environments with the ability to respond and adapt to various internal and external changes that can occur during the manufacturing process. By default, they imply efficient, reliable, and flexible material handling and transportation system, which can beeffectivelyrealized by using intelligent mobile robots. In order to achieve locomotion of an intelligent mobile robot that will minimize the usage of space within the manufacturing environment, we propose the development of a new holonomic mobile robot DOMINO (Deep learning-based Omnidirectional Mobile robot with INtelligentcOntrol). 3D model of holonomic mobile robot prototype is developed in CAD software package SolidWorks, and designed parts are produced with additive manufacturing technology. Single board computer Raspberry Pi 4 and microcontroller board Arduino Mega 2560 are used for motion control of the holonomic mobile robot, while control actions are determined by thedefinedkinematic model of the omnidirectional wheeled mobile robot. ...
Keywords: *material handling and transportation tasks,intelligent holonomic mobile robot, omnidirectional wheels, kinematic modeling, obstacle avoidance*

SAŽETAK:
Savremeni inteligentni tehnološki sistemi su dinamička okruženja sa sposobnošću da se prilagode i reaguju na različite unutrašnje i spoljašnjeporemećaje, koji mogu nastati tokom proizvodnog procesa. Ovakvi sistemi podrazumevaju efikasan, pouzdan i fleksibilan sistem manipulacije i transporta materijala, koji se efektivno može ostvariti korišćenjem inteligentnih mobilnih robota . U cilju realizovanja kretanja inteligentnog mobilnog robota kojeće minimizirati upotrebu radnog prostora u tehnološkom okruženju, u ovom radu je prikazan razvoj novog holonomnog mobilnog robota DOMINO (Deeplearning-basedOmnidirectionalMobile robot withINtelligentcOntrol). 3D model prototipa holonomnogmobilnog robota razvijen je u CAD softverskom paketu SolidWorks, a projektovani delovi proizvedeni su tehnologijom aditivne proizvodnje. Modularna računarska platformaRaspberryPi 4 i mikrokontrolerArduino Mega 2560 koriste se za kontrolu kretanja holonomnogmobilnog robota, dok su upravljačke akcije određene prema definisanom modelu kretanja mobilnog robota saomnidirekcionim točkovima. ...
Ključne reči: *zadaci manipulacije i transporta materijala, inteligentni holonomnimobilni robot, omnidirekcioni točkovi, model kretanja, sprečavanje kolizije*

FLIGHT MECHANICS, AERODYNAMICS AND MODELLING OFQUADROTOR

MEHANIKA LETA, AERODINAMIKA I DINAMIČKO MODELIRANJE KVADKOPTERA

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Đ. Jevtić


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ABSTRACT:
In recent years, quadrotors are one of the most popular platforms for the development of unmanned aerial vehicles, and their application trend is rapidly increasing for both commercial and research purposes. Their main advantages compared to other types of flying vehicles are the ability to hover, minimal operating space, vertical take-off, and landing capability, as well as smaller overall dimensions. However, their breakthrough into the market is due to their longer flight time and the fact that today they can carry much more payload. This paper aims to present the basic idea behind the conceptual development of the quadrotor, with special reference to aerodynamic effects that are important for this type of aircraft. It will be shown that, although thrust force is represented by simplified equations in literature, in the general case it depends on the vehicular velocity and its angle of attack. Therefore, its expressions will be different and will depend on flight mode, as is shown in the paper. Furthermore, it will be presented that lesspower is needed for the same thrust force when the quadrotor flights near the ground. ...

Keywords: *unmanned aerial vehicles (UAVs), quadrotor, conceptual development, aerodynamic effects, dynamic modelling*

SAŽETAK:
Poslednjih godina kvadkopteri predstavljaju jednuod najpopularnijihplatformi za razvoj bespilotnih letelica koje pronalaze sve veću primenukako u komercijalne,tako i u naučno-istraživačke svrhe.Njihove glavne prednosti u poređenju sa ostalim tipovima letelica su mogućnost lebdenja, znatno manji prostor potreban za manevrisanje, mogućnost vertikalnog poletanja i sletanja, kao i manje gabaritne dimenzije. Međutim, glavni razlog njihovog proboja na tržištu je povećanjeistrajnosti leta i činjenica da oni danas mogu da ponesu znatno više korisnog tereta.Ovajrad ima za cilj da prikaže osnovnu ideju koja se krije iza konceptualnog dizajna kvadkoptera, sa posebnim osvrtom na aerodinamičke efekte koji su važni za ovaj tip letelice. Iako se vučna sila u literaturi predstavlja uprošćenim jednačinama, biće pokazano da u opštem slučaju ona zavisi od brzine letelice i njenog napadnog ugla. Stogaće njeni izrazi biti drugačiji pri različitim letnim režimima, što će biti i pokazano u radu. Dalje će biti predstavljeno da je pri letu kvadkoptera u blizini tla za istu vučnu silu potrebna manja snaga. ...

Ključne reči: *bespilotne letelice, kvadkopter, konceptualni dizajn, aerodinamički efekti, dinamičko modeliranje*

SAFETY CULTURE IN THE FUNCTION OF OPTIMIZATION OF RAILWAY SAFETY MANAGEMENT SYSTEM

SIGURNOSNA KULTURA U FUNKCIJI OPTIMIZACIJE SISTEMA UPRAVLJANJA SIGURNOŠĆU NA ŽELJEZNICI

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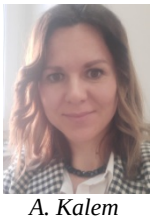
A. Kalem


O. Lindov


E. Šimić

ABSTRACT:
Safety culture in railway companies is an important element of the safety management system. The human factor is the most significantfor the safety of railway traffic because it is dominant and it is an important part of railway traffic safety. Statistic analysis of railway accidents is a clear indicator that the human factor is always a prevailing element and it is a common event, often related to the temporary unavailability of an instrumental system that should support human supervision. By implementation of ERTMS, it creates an interoperable railway system in Europe that is more efficient and safer. That system could fulfill its safety role it is necessary to ensure clear and effective instructions given to stuff which are very important for safety introduction with new and modified high integrity-based systems.

Keywords*: safety management system, safety culture, human factor, European Railway Traffic Management System*

SAŽETAK:
Sigurnosna kultura u željezničkim preduzećima važan je element sistema upravljanja sigurnošću. Ljudski faktor je najznačajniji za sigurnost željezničkog saobraćaja jer je dominantan u lancu karika sigurnosti željezničkog saobraćaja. Statističke analize nezgoda u željezničkom saobraćaju, jasno pokazuju da je ljudski faktor gotovo uvijek prevladavajući element; pokretački događaj je često povezan sa privremenom nedostupnosti instrumentalnog sistema koji bi morao podržati ljudski nadzor. Uvođenjem Evropskog sistema za upravljanje željezničkim saobraćajem (ERTMS) stvara se interoperabilni željeznički sistem u Europi koji je učinkovitiji i sigurniji. Da bi sistem ispunjavao svoju ulogu sigurnosti potrebno je osigurati jasne i efikasne insrtukcije date osoblju koje su jako bitne za sigurno upoznavanje sa novim i modificiranim sistemima baziranim na visokom integritetu.

Ključne riječi*: sistem upravljanja sigurnošću, sigurnosna kultura, ljudski faktor, Evropski sistem za upravljanje željezničkim saobraćajem*

USER'S PERCEPTION OF INNOVATIVE E-MOBILITY SERVICES

KORISNIČKA PERCEPCIJA INOVATIVNIH USLUGA E-MOBILNOSTI

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M. Vujić


L. Dedić


S. Mandžuka

ABSTRACT:
As mobility becomes an essential need in urban areas, the demand for existing transport modes upgrade is growing. To improve the overall quality of living in urban areas and to reduce the impact of regular traffic (pollution, noise emission, etc.), it is essential to widen mobility perspectives and possibilities. With the development of electric vehicles and new battery versions, and their charging, it is possible to use EV technology to improve mobility. The basic idea is to implement EV technology in existing traffic and transport modes in urban areas (public transport, taxi services, bike-sharing services, etc.) with the primary goal to reduce the number of regular road vehicles in the urban traffic network.

Keywords: *electric vehicles, e-mobility, user perspective, network quality*

REZIME:
Kako mobilnost postaje osnovna potreba u gradskim sredinama, potražnja za nadogradnjom postojećih prijevoznih modaliteta raste. Da bi se poboljšala ukupna kvaliteta života u gradskim sredinama i smanjio utjecaj ostalog prometa (zagađenje, emisija buke, itd.), bitno je proširiti perspektive i mogućnosti mobilnosti. Razvojem električnih vozila i novih verzija baterija te njihovog punjenja moguće je koristiti EV tehnologiju za poboljšanje mobilnosti. Osnovna je ideja primijeniti EV tehnologiju u postojećim prometnim modalitetima i vrstama prijevoza u gradskim sredinama (javni prijevoz, taksi usluge, usluge dijeljenja bicikala, itd.) s primarnim ciljem smanjenja broja motornih cestovnih vozila u mreži gradskog prometa.

Ključne riječi: *električna vozila, e-mobilnost, percepcija korisnika, kvaliteta mreže*

NOVE TEHNOLOGIJE I OPTIMIZACIJA SISTEMA UPRAVLJANJA SIGURNOŠĆU SA IMPLEMENTACIJOM NA ZRAČNI PROSTOR BIH

NEW TECHNOLOGIES AND OPTIMIZATION OF THE SAFETY MANAGEMENT SYSTEM WITH IMPLEMENTATION IN B&H AIRSPACE

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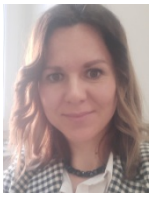
O. Lindov


A. Kalem

ABSTRACT:
Due to the large number of services involved in the flight process, it is very important to maintain safety at an acceptable level.To accomplish this, a safety management system has been developed with the main task of managing safety, including organizational structures, accountability, procedures, and policies. This paper will analyze the events that affect air traffic safety in Bosnia and Herzegovina, and from statistical analysis, will give an insight into the nature of the safety system.Based on the given research,this paper will propose measures that would significantly improve the safety management system by optimizing the safety performance activities of all subjects in terms of safety regulation and safety culture.Ultimately, the result would be a more efficient system that would increase the number of operations with a very high degree of safety.

Keywords*: Safety management system, safety reporting, airport, airspace, risk management*

SAŽETAK:
Zbog velikog broja učesnika u procesu odvijanja samo jednog leta, vrlo je važno održavati nivo sigurnosti na prihvatljivoj razini. Da bi postigli navedeni nivo, razvijen je sistem upravljanja sigurnošću (SMS) s glavnom zadaćom optimiziranja sistema sigurnosti, uključujući sve organizacijske strukture, njihove odgovornosti, postupke i politike. Ovaj rad će analizirati događaje koji utječu na sigurnost zračnog saobraćaja u Bosni i Hercegovini, te iz statističke analize dat će uvid u prirodu sistema sigurnosti. Na temelju istraživanja predložit će mjere koje bi značajno poboljšale sistem upravljanja sigurnošću optimiziranjem aktivnosti svih u učesnika po pitanju sigurnosne regulacije, izvještavanja i kulture. U konačnici, rezultat će biti učinkovitiji sistem koji će povećati broj operacija a istovremeno održati vrlo visoki stepen sigurnosti.

Ključne riječi*: Sistem upravljanja sigurnosti, izvještavanje o sigurnosti, aerodrom, zračni prostor, upravljanje rizicima*

PROPOSAL OF CONCEPTUAL MODEL FOR MANAGEMENT IMPROVEMENT OF DANGEROUS PLACES ON THE ROAD NETWORK

PRIJEDLOG KONCEPTUALNOG MODELA ZA UNAPRIJEĐENJE UPRAVLJANJA OPASNIM MJESTIMA NA CESTOVNOJ MREŽI

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ABSTRACT:
Methodological procedures for managing dangerous places on the road network differ from country to country depending on thelegislative framework governing the issue, engagement and support of state bodies, mutual harmonization and cooperation of competent and responsible institutions, data collection, availability of necessary data, accuracy and precision of data, technical support and professional training of teams and persons involved in the analyzed issues. This paper will present a conceptual model for management improvement of dangerous places, with special reference to the process of identifying dangerous places. Possibilities of application and integration of innovative methods, procedures and solutions in the function of improving the process of identification of dangerous places on the road network will also be presented. The most important influential parameters of traffic accidents on the road will be treated in particular.

Keywords: *Traffic accidents, Dangerous place, Road Safety*

REZIME:
Metodološki postupci upravljanja opasnim mjestima na cestovnoj mreži se razlikuju između pojedinih zemalja u zavisnosti od zakonodavnog okvira koji reguliše navedenu problematiku, angažiranosti i podrške državnih organa, međusobne usklađenosti i saradnje nadležnih i odgovornih institucija, načina prikupljanja podataka, dostupnosti potrebnih podataka, preciznosti i tačnosti podataka, tehničke podrške i stručne osposobljenosti timova i osoba involviranih u analiziranu problematiku. U ovom radu će biti predstavljen konceptualni model za unaprijeđenje upravljanja opasnim mjestima, sa posebnim osvrtom na proces identifikacije opasnih mjesta. Također će biti predstavljene mogućnosti primjene i integracije inovativnih metoda, postupaka i rješenja u funkciji unaprijeđenja postupka identifikacije opasnih mjesta na cestovnoj mreži. Posebno će biti tretirani najznačajniji uticajni parametri nastanka saobraćajnih.

Ključne riječi: *saobraćajne nezgode, opasno mjesto, cestovna sigurnost*

VISUAL DEEP LEARNING-BASED MOBILE ROBOT CONTROL: A NOVEL WEIGHTED FITNESS FUNCTION-BASED IMAGE REGISTRATION MODEL

VIZUELNO UPRAVLJANJE MOBILNOG ROBOTA PRIMENOM DUBOKOG MAŠINSKOG UČENJA:NOVI PRISTUP MODELIRANJU FUNKCIJE CILJA PRI REGISTRACIJI SLIKE

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M. Petrović


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Z. Miljković

ABSTRACT:
The recent development of faster and more accurate deep learning models has enabled researchers to utilize the potential of deep learning in robotics. Convolutional neural networks used for the process of semantic segmentation are being applied to improve the traditional robotic tasks by adding an additional level of intelligence, through the execution of context-aware tasks. Having that in mind, visual servoing can now be performed in a completely new manner, by exploiting only semantic and geometric knowledge about the environment. To carry out visual servoing, the mathematical model of the error between the images generated at the current and the desired mobile robot pose (i.e. position and orientation) in the image space needs to be adequately defined. In this paper, we propose the novel mathematical model for the weighted fitness function evaluation, which is utilized for the image registration process within the visual servoing framework. ...
Keywords: *mobile robot control, visual servoing, convolutional neural networks, mathematicalmodeling, deeplearning.*

SAŽETAK:
Razvoj efikasnijihmodela dubokog mašinskog učenja je omogućio istraživačima da potencijal ovih algoritama iskoriste i u oblasti robotike. U cilju povećanja nivoa inteligencije robotskih sistema prilikom izvršavanja postavljenih zadatka, konvolucione neuronske mreže semogu primenitiu procesu semantičke segmentacije scene, čime se unapređuje razumevanje okruženja u kome robot egzistira. Imajući to u vidu, vizuelno upravljanje se može izvršiti isključivo na osnovu semantičkih i geometrijskih informacija o radnom okruženju. Kako bi se ostvarilo vizuelno upravljanje, potrebno je definisati grešku u parametrima slika koje su generisane u trenutnom i željenom položaju mobilnog robota. U ovom radu, autori predlažu novi pristupmodeliranju funkcije cilja pri registraciji slike u okviru algoritma vizuelnog upravljanja. ...
Ključne reči: *upravljanje mobilnim robotima, vizuelno upravljanje, konvolucione neuronske mreže, matematičko modeliranje, duboko učenje.*

IMPLEMENTATION OF NEW TECHNOLOGIES IN THE PROMOTION OF THE CULTURAL ROUTES - PRACTICES AND CHALLENGES

PRIMJENA NOVIH TEHNOLOGIJA U PROMOCIJI KULTURNIH RUTA – PRAKSE I IZAZOVI

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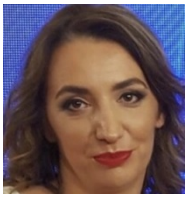

M. Orlandić *A. Jakšić-Stojanović*

ABSTRACT:
Significant changes in modern society such as globalization, internationalization, implementation of ICT technologies etc. brought a lot of changes to tourism industry. One of the most evident changes is the introduction of wide range of new specially designed products and services and the concept of Cultural Routes is one of them. This concept could be a strong framework for cooperation between towns, regions and countries in Europe that may bring a lot of benefits to different stakeholders from numerous points of view- such as economic, cultural etc. Having in mind the actual trends and perspectives on global tourism market, it would be extremely important to implement modern ICT technologies in further protection and promotion of the Cultural Routes. That may lead not only to the creation of new authentic innovative tourist products and their integration in the existing tourist offer, but also to significant improvement of the quality of tourist offer at national, regional and international level.

Keywords: *cultural routes, heritage, ICT, communication, tourism, technology*

REZIME:
Značajne promjene u savremenom društvu poput globalizacije, internacionalizacije, primjene savremenih IT su izazvale kreiranje novih turističkih proizvoda. Kulturne rute su samo jedan od njih. Ovaj koncept je izuzetno popularan u Evropi i ima veliki potencijal za buduću valorizaciju i promociju na globalnom turističkom tržištu a istovremeno postaje i snažan okvir za saradnju između gradova, regiona i zemalja u Evropi kako u ekonomskom, političkom i mnogim drugim sferama. Upravo primjena savremene IT mogu biti od velikog značaja u daljoj zaštiti i promociji Kulturnih ruta ali isto tako i do stvaranja novih autentičnih inovativnih turističkih proizvoda i njihove integracije u postojeću turističku ponudu.

Ključne riječi: *kulturne rute, nasljeđe, ICT, komunikacija, turizam, tehnologija*

THE INFLUENCE OF INTRODUCTION AND INTEGRATION OF NEW TECHNOLOGIES ON PROCESSES IN POSTAL TRAFFIC

UTJECAJ UVOĐENJA I INTEGRACIJE NOVIH TEHNLOGIJA NA PROCESE U POŠTANSKOM SAOBRAĆAJU

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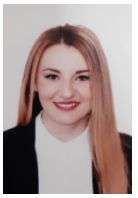
A. Medić

ABSTRACT:
Reduced social distance during a pandemic directly affects new trends and ways of using technology in business, which accelerates and introduces new technologies such as IoT and 5G network in business. In this paper, the concept of 5G and IoT architecture is proposed, which can be used in all technological phases of postal traffic. The paper presents the possibilities and challenges of introducing IoT and 5G technology in postal traffic. Special attention in the paper is focused on the technological phases of collection and delivery of shipments, and changes that occur in the processes as a result of the introduction and integration of new technologies in postal traffic.

Keywords: *Covid -19, IoT, 5G network, technology, postal traffic, technological phases.*

SAŽETAK:
Smanjena socijalna distanca tokom pandemije direktno utječe na nove trendove i načine korištenja tehnologija u poslovanju, a što ubrzava i uvođenje novih tehnologija kao što su IoT i 5G mreža u poslovanje. U ovom radu je predložen koncept arhitekture 5G i IoT koji se mogu koristiti u svim tehnološkim fazama poštanskog saobraćaja. Kroz rad su prikazane mogućnosti i izazovi uvođenja IoT i 5G tehnologija u poštanskom saobraćaju.
Posebna pažnja u radu je usmjerena ka tehnološkim fazama preuzimanja i dostave pošiljaka, te promjenama koje se dešavaju u procesima kao posljedica uvođenja i integracije novih tehnologija u poštanskom saobraćaju.

Ključne riječi: *Covid-19, IoT,5G mreža, tehnologija, poštanski saobraćaj, tehnološke faze.*

THE RISE OF DISTRIBUTED ARTIFICIAL INTELLIGENCE THROUGH SHARED DATA AND CLOUD SOLUTIONS

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A. M. Țițu


A. Staniu

ABSTRACT:
Decision-makers of present times encounter influence by an ever-increasing emotional condition created by social media, market trends, experience, and historical facts. The concept of mixed human and artificial intelligence is one of the most underrated business drivers today, and conspiracy theories, fixed mindset, and legacy systems are slowing down collective evolution. This paper intends to contribute to the everyday awareness of data sharing through cloud solutions and services. It opens a wide range of possibilities for new solutions and insights that endorse a collaborative culture where a growth mindset paired with transparency and ethics reduces time-to-value in businesses, governments, and various industries. It creates new perspectives with the help of a mixed human and artificial intelligence approach and paves the way to a safer, multi-cultural, sustainable, and ethical future.

Keywords: *distributed artificial intelligence, data sharing, cloud solutions, servies, collaboration, ethics, safety*

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1. INTRODUCTION

In an era of digital transformation, the need for collective evolution emerges through the challenges of today's and tomorrow's growing society. Starting with doctors who can "sit" behind a computer and develop life-saving vaccines [1], social entrepreneurship systems [2], a low-carbon initiative [3], solving problems has a significant focus. Stopping a pandemic, income inequality, global warming, poverty, and road casualties represent a race where every day, minute, second counts. The world population will reach 9.9 billion by 2050 [4]. The apparent advantages that artificial intelligence technology offers today, such as comfort, safety, improved customer service, and automated systems disrupting every industry, cannot accelerate the problem-solving regulations and standards to a more sustainable future. The apparent reasons why advanced technology such as machine learning, deep learning, and artificial intelligence-driven systems lack impact on real-world problems lies within the competitive landscape of today's organizations and industries.

STRENGTHENING ENGINEERING COMPETENCIES FOR THE COMPOSITE MOLDING STANDS IMPLEMENTATION

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A. E. Brom


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ABSTRACT:
Despite the active use of composites in all mechanical engineering areas, structures made of these materials productiontechnologies were formed back in the 80s of the twentieth century, and do not meet modern requirements for mass production, cost and environmental friendliness production by engineering and industrial companies.This is due to the lack of engineering competencies. It is proposed to use molding stands using a reusable flexible punch to improve competencies and their development in industrial production.

Keywords: *engineering, composites, competence, autoclave-free molding, flexible punch.*

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1. INTRODUCTION

New materials, in particular, composite ones, are gradually replacing traditional ones in all mechanical engineeringbranches.Composite materials are complex structures consisting of two or more components, which are subdivided into a reinforcing component (performs a load-bearing function) and a binder (loads distribution on the entire filler and ensuring the product shape). The most widespread are polymer composite materials, based on plastic (most often polyester and epoxy) and fibrous filler (carbon, glass, aramid, basalt fibers). Depending on the filler type, the composite properties change: glass and basalt plastics are resistant to all types of corrosion, do not dissolve in acids and alkalis, and carbon plastics have unique specific characteristics (a carbon fiber product can be up to eight times lighter than steel with the same rigidity) [1]. However, in addition to characteristics, composites are also distinguished from metals by the design and manufacturing process.Metals are isotropic materials, i.e. their characteristics are uniform in all directions. Composites, in turn, are anisotropic materials, i.e. their characteristics are uneven. Strength along and across the fibers can differ tens of times. In addition, metals are standardized materials, i.e. when designing a steel part, we only need to select a steel grade, and then use those characteristics that are set forth in ISO, ANSI, DIN, etc.In the case of composites, it is not possible to create a base of characteristics, for example, carbon fiber reinforced plastic.

ADVANTAGES OF PUMP CONTROLLED ELECTRO HYDRAULIC ACTUATORS

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ABSTRACT:
Pump controlled hydraulic cylinders or Electro Hydraulic Actuators (EHA) have shown some advantages over common hydraulic systems and Electro Mechanical Cylinder (EMC) systems. EHA applications can be found in airplanes, submarines, mobile hydraulics, etc. Some of EHA system advantages are better productivity, lower price, longer service intervals, easier maintenance, smaller quantity of hydraulic liquid needed, less hydraulic components and space required.
The paper presents comparison between EHA, EMC and common hydraulic systems, followed by development of our own testing EHA system, where besides improved energy efficiency and solving presence of moisture, system will use small amount of high-tech hydraulic liquid.

Keywords: *Electro Hydraulic Actuator, Direct driven hydraulics, Pump controlled hydraulics, Common hydraulic systems, Classical hydraulic systems, Electro Mechanical Cylinder*

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1. INTRODUCTION

Many applications and industry fields are using Linear actuators which are capable of applying high delivery forces [1]. We can see them in plastic processing machines, forming machines, presses, construction machines, forestry machines, mobile cranes, forklifts, agricultural machines, aerospace, entertainment equipment, simulators, etc. [2]. Electro Hydraulic Actuator (EHA) in our case Direct or Pump controlled hydraulic cylinderis type of hydraulic system where actuator movement is directly controlled by pump and electric motor, without need for reservoir and directional control valve. Most common hydraulic system have directional valve and reservoir. Because of extra components, common hydraulics require more space, hydraulic liquid, are more expensive, etc. Because of damping caused by valves in Common hydraulic systems, they have higher pressure losses, generate more heat and have less efficiency. EHA systems are on the other hand more efficient, since there is no damping losses from directional valves. EHA structure provides strong linear movements with minimal required energy compared to common hydraulics [3,4].

PRESSURE DROP DEVELOPMENT ON HYDRAULIC FILTER AS AN ON-LINE CONDITION MONITORING INDICATOR

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ABSTRACT:
Many modern hydraulic systems are equipped with on-line condition monitoring systems and machine self-diagnosis in order to prevent major brake-downs and other systems failures. These systems often use special on-line condition monitoring sensors to detect any sudden changes in hydraulic fluid or in hydraulic system operation.
Some of most basic self-diagnosis functions can also be implemented by recording and evaluating pressure drop development on hydraulic return-line filter. By using modern signal processing techniques the filter pressure drop can be used as an on-line condition monitoring indicator.

Keywords: *hydraulic filter, pressure drop, condition monitoring, diagnostic*

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1. INTRODUCTION

Filters in hydraulic systems are used to remove insoluble hard foreign matter (contaminants) from hydraulic fluid (particles of wear and impurities due to operation and installation…) or reduce the concentration of these particles. Impurities can damage the hydraulic system in two ways. Larger hard (e.g. metal) particles of wear and other impurities (>50 µm, like rust particles, sand, fibers, paint particles…) can cause sudden malfunctions of the hydraulic system, especially the control valves. Smaller wear particles (<10 µm) act in the hydraulic flow as an abrasive, which causes increased wear in the narrow slots and on the control edges of the sliders. Increased wear leads to greater internal leakage, resulting in greater power loss and temperature rise. [1]
The harmful effect of solid particles depends on their hardness, size and concentration of particles, as well as on the sensitivity of individual elements to contaminants. Particularly disadvantageous are solid particles of the same size as the size of the gap in the valves.
Due to the increasing operating pressures, the gaps with narrower tolerances, the zero overlap of the control spools of the control valves…, the degree of contamination of the used hydraulic fluid requires great attention.

A NEW APPROACH FOR LONG-TERM TESTING OF NEW HYDRAULIC FLUIDS

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ABSTRACT:
Testing is becoming increasingly important in product development. This is especially true with new products. Testing may refer to testing of individual materials, individual machine elements and assemblies, on testing the compatibility of materials with individual components or testing their durability. This is especially challenging in the case of testing the interaction of different materials e.g. new type of hydraulic fluid.
The paper discusses the background of such tests, presenting, as an example, all the important aspects of the approach to testing completely new types of hydraulic fluids along with commonly used hydraulic components. All the important segments of such testing will be briefly covered: from the selection of appropriate methods and strategies for testing a completely new fluid, the selection of important components and their materials to be tested along with the fluid, determining the load mode and energy aspect of the test as well the control approach including data acquisition and visualization of all important test parameters as well as providing long-term safe operation of the test.

Keywords: *testing, hydraulic fluid, approach, test device, test procedure*

1. INTRODUCTION

The lubricant used as hydraulic fluid has to meet a number of requirements. In a hydraulic system, the pump converts mechanical energy into hydraulic energy (fluid flow and pressure), which is transported to the hydraulic actuators on the output of the system. There, it is converted again, back into mechanical energy, in order to carry out useful work under all operating conditions. Except these major tasks, which are dependent on the properties of the fluid, for hydraulic fluids, a number of other requirements must be considered e. g.: good corrosion protection, provide good lubrication performance in different operating modes, be compatible with all materials commonly used in conventional hydraulic components, provide good filterability and compatibility with materials used within components, ensure low wear of components, provide long service life with low maintenance costs and need to be energy-efficient (low power transmission losses) … to name but a few of the most important.
These requirements are not only closely related to the physical and chemical properties of the fluid as such – they must also be consistent with the components used and the operating conditions. The latter is prescribed by the hydraulic component manufacturer.

ASSESSMENT OF THE IMPACT OF AUTOMATIC PARKING ON EMISSIONS OF HARMFUL SUBSTANCES IN THE GREEN LOGISTIC SYSTEM

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S. Filippova


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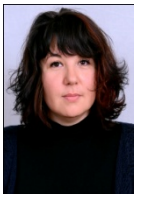
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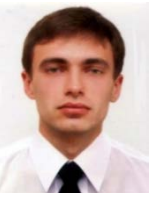
O. Vudvud


V. Dobrovolskyi

ABSTRACT:
The article is devoted to the current problem of "green" logistics - emissions of harmful substances in road transport. It was considered the main directions for reducing emissions related to both technical improvement of cars and administrative and organizational planning of traffic in cities. The article focuses on such an important aspect of planning activities related to the infrastructure of car operation as the installation of a car in a parking lot in large cities and their impact on the environment. It was estimated variants of constructions of automatic parkings are considered and their efficiency from the point of view of emissions of harmful substances.

Keywords: *green logistics, road transport, carbon emissions, automatic parkings, emissions of harmful substances*

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1. INTRODUCTION

The global car fleet is constantly growing, so in 2015 it numbered 1.25 billion cars, and by 2050 could reach 2.5 billion, due to the globalization of the economy and significant displacement of people [1]. The main environmental problem of road transport is the high toxicity of exhaust gases. They contain more than 200 toxic components, including such biologically active ones as carbon monoxide, nitrogen oxides, hydrocarbons, aldehydes, lead compounds and many others. The problem of harmful substances is especially acute in large cities, where usually the highest density of cars, which in turn is exacerbated by extremely suboptimal modes of operation. To change the current state of influence of road transport multiplied only by complex measures based on the principles of "green logistics", which includes environmentally friendly logistics technologies and measures [2]. In transport - is the use of environmentally friendly vehicles with electric, gas, hydrogen engines; use of ecological fuel; advanced training of drivers for the purpose of energy efficiency of driving; optimization of transportation routes, organization of traffic in cities, etc.

FEATURES FORMATION AUTONOMOUS POWER SUPPLY SYSTEMS OF CRITICAL INFRASTRUCTURE OBJECTS BASED ON INDUCTION GENERATOR

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ABSTRACT:
The simulation of the self-excitation process of an autonomous asynchronous generator when changing the parameters of the excitation circuit is presented in the paper. The carried out theoretical studies of the capacitive self-excitation of AC machines have created a good basis for solving issues related to the practical use of autonomous sources based on an asynchronous generator. The estimation of the backup power supply device connection time was realized experimentally.

Keywords: *autonomous power supply, induction generator, self-excitation process, self-excitation time*

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1. INTRODUCTION

Disruption of energy supply as a result of the consequences of man-made and natural disasters has several its own characteristics. Damage to power lines can be quite numerous and extensive. Even the presence of a reserve source of energy will not allow quickly supplying power to objects. In addition, the protracted impact of the disaster does not always allow working for repair crews and emergency response personnel. It is necessary to understand that it may be difficult to move on the roads due to their destruction or blockages. Thus, quick disaster recovery and power restoration are often impossible. There are consumers for whom even a short interruption in the power supply is unacceptable or their work is extremely necessary to eliminate the consequences of a natural disaster or accident, ensuring the life of the population, preventing environmental pollution, safeguarding information and material values, etc. Therefore, we increasingly come across the concept of "critical infrastructure facilities".

INFORMATION SUPPORT OF POWER QUALITY CONTROL SYSTEMS

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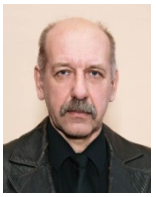
S. Tymchuk

V. Shendryk

S. Shendryk

S. Radchenko

ABSTRACT:
The harmonic analysis technique of non-stationary signals containing inter and subharmonics in power quality control systems has been improved. The discrete windowed Fourier transform and Kotelnikov's sampling theorem are used. Computer simulation of signal analysis was carried out according to the proposed technique based on the application of two window functions to the same set of samples simultaneously. Possibilities of using algorithms of discrete Fourier transform for digital processing of non-stationary signals in power supply systems are determined. The optimal procedure for such processing was selected for monitoring indicators of power quality in real-time.

Keywords: *power quality, non-stationary signal, harmonic analysis, windowed Fourier transform, discretization, modeling.*

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1. INTRODUCTION

The power quality is a component of electromagnetic compatibility, which is understood as the electrical equipment’s ability to function normally in a given electromagnetic environment, without introducing unacceptable electromagnetic interference into this environment and without experiencing it from its side.

Indicators and standards for the quality of electrical energy are established by the standard EN 50160:2010, which regulates the assessment of the harmonic components of power grid signals up to the 40th harmonic. The main indicators of power quality are deflection, oscillation, sine-range, symmetry, dip, voltage pulse, and overvoltage.

Currently, the nature of electrical loads has changed significantly. 20-30 years ago, the sinusoidality`s distortions of the voltage and current curves at the connection point to the network mainly contained canonical harmonics, the set of which is predetermined by EN 50160:2010. The shape of the distorted signals sinusoid, in this case, had a periodic, stationary, and stable character for a long time (minutes, hours) [1].

NUMERICAL SIMULATION OF RAYLEIGH-BERNARD CONVECTION AFFECTED BY LOWER WALL TEMPERATURE VARIATION

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Sadoon Ayed

ABSTRACT:
This paper represents the analysis of Rayleigh-Bernard convection between two parallel wall. Lower wall is being cooled while upper is heated according to periodic spatial distribution. This process has been modeled using , equation of continuity ,Navier-Stokes equations and energy equation. Solution of the differential equations has been obtained using pseudo spectral numeric method. For discretization in homogeneous direction, Fourier-Galerkin model has been used in MATLAB code, while for discretization in inhomogeneous direction Chebyshev collocation method is applied. Time discretization has been performed using Adams-Bashworth two step method of second order. The results of numeric simulation have been presented by four figures where vorticity fields, stream-function and velocity are shown for three different time steps.

Keywords*: Direct numerical simulation of Navier-Stokes equations, Rayleigh-Bernard convection, Prandtl number, Non-linear stability analysis.*

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1. INTRODUCTION

Rayleigh-Bernard convection is a classical problem of fluid mechanic, where the viscous fluid is flowing in between two parallel walls, while upper wall is usually cooled and lower is heated. The reason for flow appearance is temperature gradient in vertical direction which causes instability of density distribution in layers of the fluid, and thus movement. Solution to this problem has been described by Rayleigh. It is related for case where fluid is in gravitational field limited at the top and bottom sides, by horizontal walls with constant but respectively different temperatures. As a result, he got critical value of dimensionless parameter at which flow of the fluid starts. This parameter is called Rayleigh number and it is determined as:

$$Ra = \frac{g\beta(T_1 - T_2)H^3}{a\nu}$$

where$g$ is gravitational acceleration, β Thermal expansion coefficient, T_1 upper plate temperature, T_2 lower plate temperature, H distance between two plates, ν kinematic viscosity and a thermal diffusion coefficient.

POTENTIAL FOR ENERGY SAVINGS BY MAINTAINING CORRECT TYRE PRESSURE

POTENCIJAL ZA UŠTEDE ENERGIJE ODRŽAVANJEM ISPRAVNOG PRITISKA U PNEUMATICIMA

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ABSTRACT:
Reducing overall energy consumption and the negative impact on the environment is one of the basic directions in the development of modern society. For this reason, modern vehicles must be as efficient as possible. Even a small increase in the efficiency of an individual vehicle leads to a large overall reduction in energy consumption. Energy loses inevitably occurs when a vehicle is moving. One of these loses is rolling resistance which occurs due to elastic deformations of the rolling tyre. Many factors affect rolling resistance, most notably vehicle speed, tyre load and tyre pressure. In general, decrease of tyre pressure leads to an increase in rolling resistance, and energy consumption. Therefore, maintaining optimal tyre pressure is vital. But a large number of drivers do not pay enough attention to this fact and so there are a significant number of vehicles with tyres with less pressure than prescribed. Influence of tyre pressure on rolling resistance, and influence of under-inflated tyre on energy consumption was investigated in this paper. Rolling resistance energy consumption for one passenger car for different driving cycles was calculated. The potential for energy savings by maintaining the correct value of tyre pressure is pointed out.

Keywords: *vehicle, tyre, rolling resistance, tyre pressure, energy consumption*

REZIME:
Smanjenjeukupne potrošnje energije i negativnog utjecaja na okolinu je jedan od osnovnih pravaca razvoja savremenog društva. Zbog toga savremena vozila moraju biti energetski efikasna u najvećoj mogućoj mjeri. Čak i malo povećanje efikasnosti pojedinačnog vozila vodi ka značajnom ukupnom smanjenju potrošnje energije. Svako kretanja vozila neminovno dovodi do potrošnje energije. Pri kretanju vozila javljaju se otpori kotrljanja koji su posljedica elastičnih deformacija pneumatika. Na otpor kotrljanja utiču brojni faktor, prije svega brzina vozila, vertikalno opterećenje i pritisak u pneumaticima.Općenito, smanjenje pritiskau pneumaticima dovodi do povećanja otpora kotrljanja, pa je zbog toga održavanje optimalnog nivoa pritiska u pneumaticima od presudne važnosti. Međutim, veliki broj vozača ne vodi dovoljno računa o ovoj činjenici, i zbog toga je prisutan značajan broj vozila sa nedovoljno napuhanim pneumaticima. U radu je istražen utjecaj pritiska u pneumaticima na otpor kotrljanja, te utjecaj nedovoljno napuhanih pneumatika na potrošnju energije. Određeni su energetski gubici izazvani otporima kotrljanja za jedno putničko vozila. Ukazano je na potencijal za uštedama energije održavanjem ispravnog pritiska u pneumaticima.

Ključne riječi: *vozilo, pneumatici, otpor kotrljanja, pritisak u pneumatiku,potrošnja energije*

NUMERICAL INVESTIGATION OF THE CONTAMINATION THICKNESS INFLUENCE TO THE FLOW PARAMETERS FOR MULTI-HOLE ORIFICE FLOW METER

NUMERIČKA ANALIZA UTICAJA DEBLJINE NASLAGA NA PARAMETRE TOKA GASA KROZ MJERNE BLENDE SA VIŠE OTVORA

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S. Bikić


E. Džaferović

ABSTRACT:
Multi-hole orifice (MHO) flow meters are very often used for measuring the flow in the industrial processes. But nevertheless, the contamination influence to the flow parameters for MHO flow meters has not been numerically analyzed so far. In this paper, the influence of the contamination thickness to the flow parameters for MHO orifice meters with characteristic β parameter will be analysed. The pressure drop, singular pressure loss coefficient and discharge coefficient will be analysed for different values of contamination thickness and compared to the results without contamination. The grid sensitivity study will be performed for flow meter without contamination so the presented results will be grid independent.

Keywords: *multi-hole orifice flow meter (MHO), CFD, contamination, pressure drop, singular pressure coefficient, discharge coefficient*

SAŽETAK:
Mjerne blende sa više otvora se vrlo često koriste za mjerenje protoka u industrijskim procesima. Ipak, uticaj naslaga koje se formiraju oko tih mjernih blendi na parametre toka do sada nije bio numerički analiziran U ovom radu, uticaj debljine naslaga na parametre toka kroz mjerne blende sa više otvora za karakteristični parametar će biti analiziran. Pad pritiska, koeficijent pada pritiska i koeficijent protoka će biti analizirani za različite vrijednosti debljine naslaga i rezultati će biti upoređeni sa rezultatima za mjerne blende sa više otvora bez naslaga. Sistematsko ufinjavanje mreže će biti urađeno za mjerne blende sa više otvora bez naslaga, tako da će prikazani rezultati biti neovisni od mreže.

Ključne riječi: *mjerne blende sa više otvora (MBVO), CFD, naslage, pad pritiska, koeficijent pada pritiska, koeficijent protoka*

MECHANICAL - INSULATING METHOD OF HOUSEHOLD AND INDUSTRIAL WASTE UTILIZATION

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L. Ropyak


A. Velychkovych


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V. Vytvytskyi

ABSTRACT:
The study presented herein develops the ideas of the ecological processing technologies, in particular, the idea of plastic waste mechanical recycling and mechanical-insulating method of industrial waste utilization. The proposed ideas make possible processing of household and industrial waste into constructional products as the final products (plastic containers filled with compressed waste). The containers with the aggregate can be used for construction of roads, dams, underground and aboveground parking lots, foundations, non-residential premises, etc. The study develops an organizational and technical scheme of waste processing, prototypes of containers, and technological scheme of aggregation, presents analytical and experimental evaluation of strength of the container with the aggregate. The feature of the mechanical-insulating method of waste management is a comprehensive approach to the recycling process; as a result, almost all the recycled waste can be used for final products.

Keywords: *plastic recycling, secondary aggregate, natural resources, contact interaction, container, construction products, simulation, technology process*

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1. INTRODUCTION

Waste management is an issue at stake for the modern civilized world to be immediately addressed in order to save the environment.

The construction industry aims to meet the high modern requirements. However, construction progress entails increasing of negative impact on the environment. The preliminary stage of construction envisages the site preparation for construction projects including dismantling of existing structures. This generates tons of waste, which are most often taken to unauthorized landfills, and ideally, to authorized ones[1], [2].

Today plastic disposal is a serious environmental problem over the world. In particular, accumulated polyethylene terephthalate waste from disposable drinking water bottles threats the environment [3].

NUMERICAL SIMULATION OF A CRYOGENIC PLANT FOR THE COOLING OF MASHED GRAPES

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A. Formato


F. Villecco

ABSTRACT:
A numerical model of cryo-maceration plant for mashed grapes has been realized to simulate the rapid cooling process for mashed grapes according to the number of nozzles enabled to inject CO2, to their flow and temperature of CO_2 injected. ANSYS CFX program was used and two geometries have been considered with the axisof each nozzleorthogonal and parallel to the flow direction. Different boundary conditions have been considered. For the models have been considered the most burdensome condition.

Keywords: *numerical simulation, cryo-maceration plant, liquid CO_2*

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1. INTRODUCTION

Plants for cryo-maceration to perform rapid cooling of mashed grapes are used to realize adjustable temperature difference DT between 12 and 25 °C with respect to the ambient temperature [1,2]. These plants[3,4] havethe nozzles that inject liquid $CO_2$for the mashed grapes refrigeration.[5], and they guarantee an optimal refrigeration process[6,7]. The plant is composed by:[8] Liquid carbon dioxide injector,Transfer pipeline, Solid-gas separation cyclone. The inlet of the injector is formed by a tube[9] in which the nozzles for injecting carbon snow are inserted.[10]. Further, there is a temperature probe, and a pressure switch suitable to detect any malfunctions of the injection system[11]. The transfer piping[12,13] links the injector to the separation cyclone.[14].

2. RESEARCH METHODOLOGY

The plant, consists of two pipes, both of circular cross-section, connected by a divergent stretch [15]. It is vertically arranged, and the flow of grapes is pressed from bottom to top [16]. The pipe upstream of the divergent has a diameter of 100 mm and is 100 mm long, while that downstream of the divergent has a diameter of 300 mm and is 6 m long [17].

MANUFACTURING ANALYSIS OF HIGH-PRESSURE GEAR PUMPS: A CASE STUDY FROM SERBIA

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M. Živković


P. Dašić


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ABSTRACT:
A decisive impact on the cost-effectiveness of any production is an integrated approach to product development. Constructors/designers, for this reason, strive to make the chosen solution so designed that it requires a minimum of material and time for its development. However, in product design, functional properties are what the designer must give priority to. As gear pump are of fixed working volumes, the most frequently used drive device of hydraulic systems, the manufacturability of their production will be analysed. The production of gear pumps, today, can be considered a real example of meeting the requirements of the circular economy. Gear pumps with involute external gearing have been produced very successfully for more than 70 years in the company PPT-Hidraulika (Trstenik - Serbia). The paper analyses the influence of the size of the pump specific flow of on the weight ratios (consumption of raw/starting material and weight of the finished pump). It should point out possible savings in raw (starting) material, for their production, and suggestions for possible design improvements and immediate production.

Keywords: *Gear pump, manufacturability, circular economy, weight ratio.*

THERMAL IMAGER HARDWARE AND SOFTWARE DESIGN CONCEPT

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James Brennan


Migdat Hodzic

ABSTRACT:
This paper describes a preliminary system design overview of a HW and SW platform for thermal applications using a Lepton thermal sensor and Raspberry Pi 3 for accessing data from the thermal camera over its SPI interface. The data is then mapped and formatted into a 480 x 360 display image. A minimal hardware control connection using serial output (MISO), clock, and CE between the Lepton and Raspberry Pi is all that is needed to capture data. Software development can be directly undertaken on the Raspberry Pi with the installation of Qt4 Creator. With minimal modification, software modules in reference [2] can be used to process and display the thermal image on an HDMI display.

Keywords: *Thermal, Lepton Thermal Imaging camera, Rapsberry Pi platform, Qt Creator, SW, HW*

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1. INTRODUCTION

This paper presents a preliminary system design concept for the high-level hardware and embedded software aspects of a Thermal Imaging System. There are many papers which describe a variety of thermal applications, see for example [3]. The design described in this paper will meet the following criteria:

- To provide a basic overview of the Thermal Imaging System and supply enough information for the reader to understand the design approach.
- To serve as a reference for design and implementation of a more detailed requirements specification.
- To provide as complete a design start as possible, and act as a basis for other documents that might arise from it.
- The terminology found in this document to describe functions and features are as flexible in nature as possible, and intended to provide “guidance with a starting point”, rather than firm requirements.

TiO_2 – BASED NANOCOMPOSITES FOR PHOTOCATALYTIC DEGRADATION OF DYES AND DRUGS

NANOKOMPOZITI NA BAZI TiO_2 ZA FOTOKATALITIČKU DEGRADACIJU BOJA I LIJEKOVA

***Amra Bratovcic*[1]**
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Amra Bratovcic

ABSTRACT:
Titanium dioxide (TiO_2) has attracted increasing attention as a candidate for the photocatalytic degradation of organic compounds. However, the main drawback of pristine TiO_2 is a large band gap (3.2 eV) and fast recombination of electrons and holes. Recently, considerable progress has been made in the improvement of the light absorption efficiency including transition metal cation doping, non-metal anion doping, semiconductor heterojunctions and surface modification with noble metals making a various composites. Organic compounds, generated from pharmaceutical and textile industries produce a range of the problematic pollutants in wastewater. This paper discusses on heterogeneous photocatalysis for the degradation of dyes and drugs which are the major wastewater pollutants. By photocatalytic degradation, the nanocomposites synthetized are able to remove 80 – 99 % of organic pollutants in aqueous solution under UV and visible light.

Keywords: *titanium dioxide, nanocomposites, drugs, dyes, photocatalytic degradation*

REZIME:
Titanium diokid (TiO_2) sve više privlači pažnju kao kandidat za fotokatalitičku degradaciju organskih jedinjenja. Međutim, glavni nedostatak netaknutog TiO_2 je velika širina pojasa (3.2 eV) i brza rekombinacija elektrona i šupljina. Nedavno je postignut značajan napredak u poboljšanju efikasnosti apsorpcije svjetlosti uključujući doping kationima prelaznih metala, doping anionima nemetala, heterojukciju poluprovodnika i modifikaciju površine sa plemenitim metalima stvarajući različite kompozite. Organski spojevi, nastali iz farmaceutske i tekstilne industrije proizvode niz problematičnih polutanata u otpadnim vodama. U ovom radu se govori o heterogenoj fotokatalizi za degradaciju boja i lijekova ka oglavnih polutanata u otpadnim vodama. Fotokatalitičkom degradacijom, sintetizirani nanokompoziti mogu ukloniti 80-99% organskih polutanata u vodenom rastvoru pod UV i vidljivom svjetlošću.

Ključne riječi: *titanium dioksid, nanokompoziti, lijekovi, boje, fotokatalitičkadegradacija*

A NOVEL DEVICE FOR THE SOIL STERILIZING IN SUSTAINABLE AGRICULTURE

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A. Formato


R. Romano


F. Villecco

ABSTRACT:
In this paper a machine that performed the soil sterilization has been designed. The soil is cut and put in a loading hopper and downloaded in a rotating cylinder placed on the machine. The fins located inside the rotating cylinder performed the crushing and the mixing of the soil. Each soil particle through the temperature field ranged between 290-1900 °C for 3-5 minutes and a preset output soil temperature of 130-140 °C is reached and discharged downward.It maintained the process temperature long enough, to allow the elimination of the infesting organisms located in the considered soil.

Keywords: *soil thermal exchange, soil sterilizing, soil sterilizing machineries*

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1. INTRODUCTION

The soil thermal sterilization [1,2,3]consists of temperature increasing of each soil particle up to a determined value[4,5], for a sufficient time to reduce the bacterial load [6]. It has been observed by different authors [7,8], that the decrement of the cells of a microorganism, it follows a kinetics of the first order,

$$\frac{dN}{dt} = -kxN \quad (1)$$

where N is the number of cells present and the constant k (constant of extinction) it depends from the type of microorganism and temperature [9]. It is defined Thermal Death Time (TDT), the necessary time to kill a determined number of microorganisms at a specific temperature, and it is time range corresponding to 12 times the time of decimal reduction:

$$TDT = 12 \times D \quad (2)$$

where D is the time of decimal reduction or the time required to destroy the 90% of the microorganisms [10-13].

DETERMINATION OF HEAVY METALS IN WILD MUSHROOMS FROM WESTERN BOSNIA

ODREĐIVANJE TEŠKIH METALA U DIVLJIM GLJIVAMA IZ ZAPADNE BOSNE

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A. Šapčanin


E. Pehlić


E. Ramić


S. Korać


B. Pehlivanović

ABSTRACT:
Heavy metals, such as: As, Cd, Pb, Zn, Co, Cu, Ni, Fe, Cr and Se in different wild edible mushroom species (Macrolepiota procera, Agaricus campester , Amanita caesarea , Boletus edulis, Lycoperdon pyriforme, Agaricus urinascens) collected from western Bosnia were examined by flame atomic absorption spectroscopy (F-AAS) after lyophilisation and microwave digestion. All element concentrations were determined on a dry weight basis. The ranges of element concentrations for As, Cd, Pb and Zn were 0.81-18.96, 28.88-73.64, 48.39-170.39 and 21.96-66.81 ppb, respectively. The ranges of element concentrations for Co, Cu, Ni, Fe, Cr and Se were 0.49-5.40, 7.37-35.53, 0.50-1.83, 62.87-239.34, 0.48-1.32, 0.01-0.03 ppm, respectively. In general, content of iron and copper was higher than other measured metals in all mushroom species. This study is first report on the heavy metal levels in wild mushrooms from western Bosnia.
Keywords: *wild edible mushrooms, heavy metals, flame atomic absorption spectroscopy (F-AAS), western Bosnia.*

REZIME:
Teški metali poput: As, Cd, Pb, Zn, Co, Cu, Ni, Fe, Cr i Se u različitim divljim jestivim vrstama gljiva (Macrolepiota procera, Agaricus campester, Amanita caesarea, Boletus edulis, Lycoperdon pyriforme, Agaricus urinascens) zapadne Bosne ispitivano je plamenom atomskom apsorpcijskom spektroskopijom (F-AAS) nakon liofilizacije i mikrovalne digestije. Sve koncentracije elemenata određene su na osnovi suhe mase. Rasponi koncentracija elemenata za As, Cd, Pb i Zn iznosili su 0,81-18,96, 28,88-73,64, 48,39-170,39, odnosno 21,96-66,81 ppb. Rasponi koncentracija elemenata za Co, Cu, Ni, Fe, Cr i Se iznosili su 0,49-5,40, 7,37-35,53, 0,50-1,83, 62,87-239,34, 0,48-1,32, 0,01-0,03 ppm. Općenito, sadržaj željeza i bakra bio je veći od ostalih izmjerenih metala u svim vrstama gljiva. Ova studija je prvo izvješće o razinama teških metala u divljim gljivama iz zapadne Bosne.
Ključne riječi*: divlje jestive gljive, teški metali, plamena atomska apsorpcijska spektroskopija (F-AAS), zapadna Bosna.*

IN SILICO ANALYSIS OF SCOPOLETIN INTERACTION WITH POTENTIAL SARS-CoV-2 TARGET

IN SILICO ANALIZA INTERAKCIJE SKOPOLETINA SA POTENCIJALNOM SARS-CoV-2 METOM

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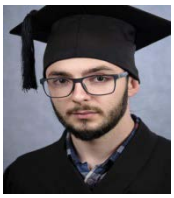
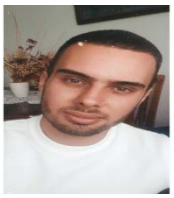
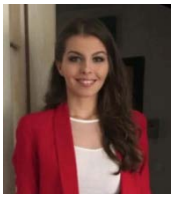

T. Ikanovic


E. Sehercehajic


B. Saric


N. Tomic


R. Hadziselimovic

ABSTRACT:
SARS-CoV-2 virus belongs to the family Coronaviridae, genus Betacoronavirus that appeared in late 2019 in Wuhan, China caused the historically remembered pandemic of COVID-19 which is still not subsiding. The main protease, or Mpro, plays a key role in the expression and replication of viral genes and is therefore an extremely attractive target for the design of antiviral drugs against SARS-CoV-2. Numerous herbal components have been studied for their natural ability to be effective antiviral agents. Scopoletin (6-methoxy-7-hydroxycoumarin) is a coumarin compound with antimicrobial, anti-inflammatory, antioxidant, antitumor and hepatoprotective properties that has been isolated from several plant species (Scopolia japonica - Japanese belladonna, Artemisia scoparia - wormwood and Viburnum prunifolium - black haw). ...

Keywords: *scopoletin, SARS-CoV-2, main protease, in silico analysis, anti-viral effect*

SAŽETAK:
SARS-CoV-2 virus pripada porodici Coronaviridae, rodu Betacoronavirus koji je pojavivši se krajem 2019 godine u Wuhanu, Kina uzrokovao historijski zapamćenu pandemiju COVID-19 koja još uvijek ne jenjava. Glavna proteaza odnosno Mpro ima ključnu ulogu u ekspresiji i replikaciji virusnih gena, stoga je izuzetno privlačna meta za dizajn antiviralnih lijekova protiv SARS-CoV-2. Brojne biljne komponente su istraživane zbog njihove prirodne sposobnosti da budu efikasni antiviralni agensi. Skopoletin (6-metoksi-7-hidroksikumarin) je kumarinski spoj antimikrobnih, protuupalnih, antioksidativnih, protutumorskih i hepatoprotektivnih svojstava koji je izoliran iz nekoliko biljnih vrsta (Scopolia japonica - japanska belladonna, Artemisia scoparia - pelin i Viburnum prunifolium - crna glog). ....

Ključne riječi: *skopoletin, SARS-CoV-2, glavna proteaza, in silico analiza, antiviralni efekat*

THE INFLUENCE OF WASTWATER ON THE PHYSICAL AND CHEMICAL PARAMETERS OF THE RIVER BREGAVA

UTICAJ OTPADNIH VODA NA FIZIČKO-HEMIJSKE PARAMETRE RIJEKE BREGAVE

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D. Ivanković


M. Šahinagić-Isović


F. Ćatović


A. Šestan

ABSTRACT:
Water is one of the most important raw materials on Earth. Without water life would not be possible. It is the most fluid raw material with great capability to receive and distribute a variety of substances including pollutants. Firstly, the source of the Bregava river in Stolac is important because of the living evolutions, which are not possible without water. Secondly, it is important because of the daily usages, where the most important ones are drinking water, domestic and agricultural usage. In this paper, the physico- chemical parameters of the water quality of the river Bregava are analysed as indicators of the impact of municipal wastewater. The samples of the water have been taken from three different sample - places throughout the flow of the river Bregava in the period of high and low water level of the river. The presented results of physical and chemical parameters of water indicate the degree of load of the Bregava river watercourse with pollutants.

Keywords: *Stolac, Bregava, pollution, water quality,physico - chemical parameters*

REZIME:
Voda predstavlja jednu od najvažnijih sirovina bez koje život na planeti Zemlji ne bi bio moguć. To je najpokretljivija sirovina sa velikom moći da primi i transportuje najraznovrsnije supstance među kojima su i zagađivači. Izvorišterijeke Bregaveza grad Stolac je značajno prije svega zbog životnih procesa koji su nemogući bez vode, a zatim zbog svakodnevne primjene od kojih su najvažnije: voda za piće, upotreba u domaćinstvu i poljoprivredi.U ovom radu analizirani su fizičko-hemijski parametri kvaliteta vode rijeke Bregave kao pokazatelji uticaja komunalnih otpadnih voda. Uzorci vode uzeti su sa tri različita mjesta uzorkovanja tokom cijelog toka rijeke Bregave u periodu visokog i niskog vodostaja rijeke. Prikazani rezultati fizičko-hemijskih parametara vode ukazuju na stepen opterećenja vodotoka rijeke Bregave zagađivačima.

Ključne riječi*: Stolac, Bregava, zagađenje, kvaliteta vode, fizičko-hemijski parametri*

MORPHOMETRIC CHARACTERISTICS OF ALPINE NEWT– ICHTHYOSAURA ALPESTRIS (LAURENTI, 1768) FROM LAKE HRID (MONTENEGRO)

MORFOMETRIJSKE KARAKTERISTIKE PLANINSKOG MRMOLJKA – ICHTHYOSAURA ALPESTRIS (LAURENTI, 1768) IZ HRIDSKOG JEZERA (CRNA GORA)

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Isat Skenderović


Eldar Tanović


Ibro Skenderović

ABSTRACT:
The population research on the species Ichthyosaura alpestris (Laurenti,1768) included female newts from Lake Hrid during two time periods (June-July) 2019, and (June, July) 2020. In 2019, total 14 Alpine newts were sampled, while the number of sampled Alpine newts was 36 in the year of 2020. Analysis of the results on measuring morphometric character of the female population of the species Ichthyosauraalpestris (Laurenti, 1768) for the studied period showed small variations. Research has shown that the average head length is higher in females sampled during 2019, while the other average values of the studied parameters are higher in females sampled during 2020. The t-test results showed that the differences were not statistically significant (t> 0.05) after processing the results on measuring morphometric character of the researched population of the species. It can also be seen that the Fulton's condition factor is higher in female species sampled in 2019, in comparison to the ones sampled in 2020.
Keywords: *Morphometry, Ichthyosaura alpestris, Lake Hrid.*

REZIME:
Istraživanje populacija vrste Ichthyosaura alpestris (Laurenti,1768) je obuhvatilo jedinke ženskog pola u dva vremenska perioda i to (juni-juli) 2019 godine i (juni-juli) 2020 godine iz Hridskog jezera. Tokom 2019. godine uzorkovano je 14 jedinki planinskog mrmoljka, dok je broj uzorkovanih jedinki tokom 2020 godine veći - 36. Analiza rezultata mjerenja morfometrijskih karaktera populacija ženki vrste Ichthyosaura alpestris (Laurenti,1768) za istraživani period su pokazala mala variranja. Istraživanja su pokazala da je prosječna dužina glave veća kod jedinki uzorkovanih tokom 2019 godine, dok su ostale srednje vrijednosti istraživanih parametara veće kod jedinki uzorkovanih tokom 2020. godine. Rezultati t-test su pokazali da razlike nisu statistički značajne (t > 0,05) nakon obrade rezultata mjerenja morfometrijskih parametara istraživanih jedinki. Isto tako možemo primijetiti da je Fultonov koeficijent kondicije veći kod jedinki uzorkovanih tokom 2019. godine u odnosu na jedinke uzorkovane ljeta 2020. godine
Ključnereči*: Morfometrija, Ichthyosaura alpestris, Hridskojezero.*

ANALYSIS OF TECHNOLOGIES AND TECHNOLOGICAL PROCESS OF FOREST HARVESTING – CASE STUDY TUZLA CANTON

ANALIZA TEHNOLOGIJA I TEHNOLOŠKOG PROCESA ISKORIŠTAVANJA ŠUMA NA PODRUČJU TUZLANSKOG KANTONA

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V. Halilović


J. Musić


J. Knežević


E. Jusufović

ABSTRACT:
Utilisation of machinery in forestry requires the knowledge of them, regardless if they are new or adjusted, reconstructed or upgraded. The main objective of this document is to analyse technology and technology process of forest utilisation in the area of Tuzla Canton. Conducted researches are mainly based on data gathered in direct contact with persons that are involved in these processes in forestry, as in the company, as well as in private sector. Based on gathered data we have determined that average age of chainsaws in company is 4.4 years, and in private sector, it is 3.6 years. In the phase of wood assortment skidding, the company with own capacities executes 40% of works, and private companies execute 60% of works. Company 'TK šume' owns 22 tractors, and private companies own 28 tractors, which are enabled to work in forest. Average age of all analysed tractors is 22 years. ...

Keywords: *Forestry, utilisation of machinery, technology, technology process, chainsaw, tractors*

REZIME:
Korištenje strojeva u šumarstvu zahtijeva i njihovo poznavanje, bez obzira da li su oni novi, ili dobiveni prilagodbom, pregradnjom ili nadogradnjom. Osnovni cilj ovoga rada je analiza tehnologija i tehnološkog procesa iskorištavanja šuma na području Tuzlanskog kantona. Istraživanja koja su provedena zasnivaju se uglavnom na podacima koji su prikupljeni prilikom direktnog kontakta sa osobama koje su vezane za ove procese u šumarstvu, kako u samom preduzeću tako i u privatnom sektoru. Na osnovu prikupljenih podataka utvrđeno je da je prosječna starost motornih pila u preduzeću 4,4 godine, a u privatnim preduzećima 3,6 godina. U fazi privlačenja drveta, preduzeće vlastitim kapacitetima realizuje 40% radova, a privatna preduzeća 60%.Preduzeće „TK šume“ posjeduje 22 traktora, a privatna preduzeća 28 traktora prilagođenih radu u šumi. Prosječna starost svih analiziranih traktora iznosi 22 godine. ...

Ključne riječi: *šumarstvo, korištenje strojeva, tehnologija, tehnološki proces, motorne pile, traktori*

MICROBIC TOXINS IN CEREALS

MIKROBNI TOKSINI U ŽITARICAMA

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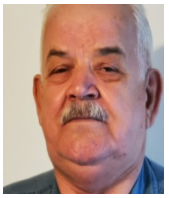
H. Jukić


I. Radočaj


M. Blažić


I. Mujić


S. Zavadlav

ABSTRACT:
Along with a series of microorganisms, different moulds occur as causes for the spoilage of different foods of plant and animal origin. Their metabolites, i.e. secondary products of metabolism called mycotoxins are a group of natural compounds that differ in chemical structure and biological activity. Mycotoxins have different toxic effects in human and animal organisms and can cause dangerous diseases called mycotoxicoses. In addition to bacterial and fungal toxins, toxic products can also be produced by other simple microorganisms. These toxic products pose a great danger to the human body. For detecting microbiotic toxins in the study was used peanut paste, nuts, poppy seeds and white bread. According to analyzes of total aflatoxins, aflatoxins B1 and ochratoxins, can be ascertained that toxins at a significant concentration rarely occur in finished processed products such as peanut paste, poppy seeds and white bread.

Keywords: *aflatoxins, cereals, mildew, mycotoxicoses, mycotoxins*

REZIME:
Zajedno sa nizom mikroorganizama, javljaju se i različite plijesni kao uzroci kvarenja različitih namirnica biljnog i životinjskog porijekla. Njihovi metaboliti, odnosno sekundarni proizvodi metabolizma nazvani mikotoksini su grupa prirodnih spojeva koja se razlikuju u kemijskoj strukturi i biološkoj aktivnosti. Mikotoksini imaju različita toksična dejstva na ljudski i životinjski organizam i mogu izazvati opasne bolesti zvane mikotoksikoze. Pored bakterijskih i gljivičnih toksina, toksične proizvode mogu proizvoditi i drugi jednostavni mikroorganizmi. Ovi toksični proizvodi predstavljaju veliku opasnost za ljudsko tijelo. Za otkrivanje mikrobiotskih mikotoksina u studiji je korištena pasta od kikirikija, orašasti plodovi, sjemenke maka i bijeli kruh. Prema analizama ukupnih aflatoksina, aflatoksina B1 i ohratoksina, može se utvrditi da se toksini u značajnoj koncentraciji rijetko javljaju u gotovim prerađenim proizvodima poput paste od kikirikija, sjemenkama maka i bijelom kruhu.

Ključne riječi: *aflatoksini, žitarice, plijesni, mikotoksikoze, mikotoksini*

APPLICATION OF NANOTECHNOLOGY IN FOOD PACKAGING

PRIMJENA NANOTEHNOLOGIJE U PAKOVANJU PREHRAMBENIH PROIZVODA

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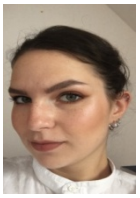
A. Ibrahimović


A. Stambolić


E. Omanović- Mikličanin

ABSTRACT:
On its way from production to the finished product, food comes into contact with various materials. However, it has the longest contact with the packaging in which it is packed, which is why it is important that the packaging is of high quality and health safe. The main role of packaging is to serve as a protective barrier that protects the product from external influences and facilitates the transport of products, which makes the product without packaging practically unimaginable on the market. Nowadays, plastic is most often used as packaging for food products, which due to monomers, various additives and other substances that can migrate from the packaging to the food product leads to numerous diseases of consumers. From this we can see that in addition to the positive properties of packaging, it can also have a negative impact on food products. It is these migrations of toxic substances from plastic packaging that pose a problem due to the possibility of numerous diseases, which is why attempts are being made to find a solution to the problem by applying nanotechnology. ...

Keywords: *Nanotechnology, packaging, food, intelligent*

REZIME:
Na svom putu od proizvodnje do gotovog proizvoda, hrana dolazi u kontakt sa raznim materijalima. Ipak, najduži kontakt ostvaruje sa ambalažom u koju je upakovana zbog čega je bitno da ambalaža bude kvalitetna i zdravstveno ispravna. Glavna uloga ambalaže jeste da služi kao zaštitna barijera koja štiti proizvod od spoljašnjih uticaja te olakšava transport proizvoda zbog čega je proizvod bez ambalaže praktično nezamisliv na tržištu. U današnje vrijeme se najčešće kao ambalaža za prehrambene proizvode koristi plastika koja zbog monomera, raznih dodataka te drugih materija koje mogu migrirati iz ambalaže u prehrambeni proizvod dovodi do brojnih oboljenja konzumenata. Iz toga vidimo da i pored pozitivnih svojstava ambalaže ona može da ima i negativan uticaj na prehrambene proizvode. Upravo te migracije toksičnih materija iz plastične ambalaže predstavljaju problem zbog mogućnosti nastanka brojnih oboljenja zbog čega se pokušava naći riješenje problema primjenom nanotehnologije. ...

Ključne riječi: *Nanotehnologija, ambalaža, hrana, inteligentna*

APPLICATION OF NANOTECHNOLOGY IN FOOD ENGINEERING

PRIMJENA NANOTEHNOLOGIJE U INŽENJERSTVU HRANE

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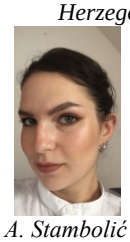
M. Ćibo


A. Stambolić


E. Omanović-Mikličanin

ABSTRACT:
Nanotechnology, due to its wide application and the advantages it brings to all branches of industry, is considered a new technological revolution. This work describes one of its most important applications, in food engineering. The main reasons for the application of nanotechnology in the food industry are the desire for a better life, the need for greater security, and the increase in the population of the Earth, which would also increase the demand for food. Nano-food is the food obtained by use of nanotechnology, whether during its production, processing, packaging, storage, distribution or sale. By using different nanoparticles, nanosensors and other nanomaterials, it is possible to create a new system, a system in which could be produced food who is safer, better quality, better nutritional composition, and which could act more efficiently and effectively in the body due to the presence of such tiny particles at the nanolevel. The greatest potential of this technology is in the field of nanopackaging, which in the future could communicate with the consumer and thus ensure security and transparency, which occupy the most important place among modern consumers.

Keywords: *nanotechnology, application, nano-food, nanomaterials, nanopackaging*

REZIME:
Nanotehnologija se, zbog svoje široke primjene i prednosti koje donosi u sve grane industrije, smatra novom tehnološkom revolucijom. U ovom radu opisana je jedna od njenih najvažnijih primjena, i to u inženjerstvu hrane. Glavni razlozi primjene nanotehnologije u prehrambenoj industriji su želja za boljim životom, potreba za većom sigurnošću, te porast broja stanovnika na Zemlji, čime bi se povećala i potražnja za hranom. Nano-hranom se smatra hrana koja je dobivena pomoću nanotehnologije bilo da je to tokom njene proizvodnje, prerade, pakovanja, skladištenja, distribucije ili prodaje. Korištenjem različitih nanočestica, nanosenzora i drugih nanomaterijala moguće je stvoriti jedan novi sistem, sistem u kojem bi se mogla proizvoditi hrana koja je sigurnija, bolje kvalitete, boljeg nutritivnog sastava, a koja bi u organizmu zbog prisutnosti tako sitnih čestica na nanonivou mogla djelovati i efikasnije i efektivnije. Najveći potencijal ove tehnologije jeste u oblasti nanopakovanja, koja bi u budućnosti mogla komunicirati sa potrošačem i tako osigurati sigurnost i transparentnost, koji kod savremenih potrošača zauzimaju najznačajnije mjesto.

Ključne riječi: *nanotehnologija, primjena,nano-hrana, nanomaterijali, nanopakovanje*

RECENT DEVELOPMENTS ON METAL OXIDE - BASED GAS SENSORS FOR ENVIRONMENTAL POLLUTION CONTROL

POSLJEDNJI RAZVOJ METAL OKSIDNIH GASNIH SENZORA ZA KONTROLU ZAGAĐENJA OKOLIŠA

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Amra Bratovcic

ABSTRACT:
Many toxic gases are released or emitted in the environment and exist in the atmosphere such as hydrocarbons (HCs), nitrogen oxides (NOx), carbon monoxide (CO), carbon dioxide (CO_2), sulfur dioxide (SO_2), ammonia (NH_3), hydrogen sulfide (H_2S), and volatile organic compounds (VOCs) even in small concentrations can cause various health problems and poisoning. Therefore, sensitive technological devices are necessary to detect the presence of toxic and dangerous gases in the environment. Nanotechnology-based on metal oxide gas sensors can overcome this problem. Semiconductor metal oxide nanostructures have proven to be highly suitable for applications in sensors due to their high sensitivity, chemical, and thermal stability, and large surface-to-volume ratio. Apart from sensitivity, selectivity, stability, and speed parameters, recovery time, response time and power consumption are also other which determines sensor device. Metal oxide-based gas sensors work based on the change in electrical conductivity due to charge transfer between surface complexes and interacting molecules. ...
Keywords: *gas sensors, metal oxides, nanostructures.*

REZIME:
Mnogi se otrovni gasovi oslobađaju ili emitiraju u okoliš i postoje u atmosferi poput ugljikovodika (HCs), azoznih oksida (NOx), ugljičnog monoksida (CO), ugljičnog dioksida (CO_2), sumpornog dioksida (SO_2), amonijaka (NH_3), sumporovodika (H_2S) i isparljivi organski spojevi (VOCs) čak i u malim koncentracijama mogu uzrokovati razne zdravstvene probleme i trovanja. Stoga su osjetljivi tehnološki uređaji neophodni za otkrivanje prisutnosti otrovnih i opasnih gasova u okolišu. Nanotehnologija zasnovana na gasnim senzorima metalnih oksida može savladati ovaj problem. Nanostrukture poluprovodnih metalnog oksida pokazale su se vrlo pogodnima za primjenu u senzorima zbog svoje visoke osjetljivosti, hemijske i toplinske stabilnosti i velikog omjera površine i volumena. Osim parametara osjetljivosti, selektivnosti, stabilnosti i brzine, vrijeme oporavka, vrijeme odziva i potrošnja energije također su nešto što određuje senzorski uređaj. Metal oksidni senzori rade na temelju promjene električne vodljivosti uslijed prijenosa naboja između površinskih kompleksa i molekula koje međusobno djeluju. ...
Ključne riječi: *gasnisenzori,metalnioksidi, nanostructure.*

CONSIDERATION OF THE POSSIBILITY OF USING OZONE IN THE TREATMENT OF DRINKING WATER IN THE "TILAVA" WATER SUPPLY SYSTEM

RAZMATRANJE MOGUĆNOSTI PRIMJENE OZONA U TRETMANU VODE ZA PIĆE NA VODOVODNOM SISTEMU „TILAVA“

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J. Blagojević


G. Orašanin


S. Simić

ABSTRACT:
In Bosnia and Herzegovina and in the countries in the region, chlorine and its compounds are mainly used as a disinfectant in the process of purifying drinking water. It is a well-known fact that the reaction of chlorine and organic matter in water creates carcinogenic compounds, trihalomethanes, which can negatively affect the health of the population if they are consumed for many years. Therefore, it is necessary to look for an alternative for chlorine. This paper discusses the possibility of using ozone in the treatment of drinking water in the "Tilava" water supply system.

Keywords: *Ozone, Water purification, Water quality, Water supply system "Tilava"*

REZIME:
U Bosni i Hercegovini i u zemljama u regionu uglavnom se kao dezinfekciono sredstvo u procesu prečišćavanja vode za piće koristi hlor i njegova jedinjenja. Opšte poznata činjenica je da se reakcijom hlora i organskih materija u vodi stvaraju kancerogena jedinjenja, trihalometani koji mogu negativno uticati na zdravlje stanovništva ukoliko se unose u organizam duži niz godina. Stoga je potrebno tražiti alternativu hloru. U radu je razmatrana mogućnost primjene ozona u tretmanu vode za piće na vodovodnom sistemu „Tilava“.

Ključne reči: *Ozon, prečišćavanje vode za piće, kvalitet vode,vodovodni sistem „Tilava*

ESTIMATING THE HEALTH RISK OF HEAVY METALS IN EDIBLE PLANTS TO THE GENERAL POPULATION IN SARAJEVO, B&H

PROCJENA ZDRAVSTVENOG RIZIKA OD TEŠKIH METALA U JESTIVIM BILJKAMA PO STANOVNIŠTVO U SARAJEVU, BiH

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A. Šapčanin


E. Pehlić


S. Korać


E. Ramić


B. Pehlivanović

ABSTRACT:
The heavy metals such as Zn, Co, Fe, Se, As, Cd and Pb in the samples of different edible plant, vegetables and fruits bought from bosnian market were determined by using an atomic absorption spectrophotometry (AAS). The study results showed that the contents of the most toxic heavy metals Cd and As were < 0,001 mg/L in all investigated plant samples. The values of heavy metal accumulation in edible plants were used to calculate the estimated daily intake of metals (EDI), target hazard quotients (THQ) and hazard index (HI). The THQ was lower than 1 for all age groups, indicating that it was still safe for the general population of Sarajevo to consume edible plants, fruits and vegetables offered in market places.

Key words: *heavy metals**,** health risk**,** estimated daily intake,Sarajevo, edible plants.*

REZIME:
Teški metali poput Zn, Co, Fe, Se, As, Cd i Pb u uzorcima različitih jestivih biljaka, povrća i voćakupljenih na bosanskim tržnicama su određeni upotrebom atomske apsorpcijske spektrofotometrije (AAS). Rezultati studije pokazali su da je sadržaj najotrovnijih teških metala Cd i As bio < 0,001 mg / L u svim ispitivanim biljnim uzorcima. U analiziranom biljnom materijalu otkriveni su i drugi teški metali. Vrijednosti nakupljanja teških metala u jestivim biljkama korištene su za izračun procijenjenog dnevnog unosa metala (EDI), ciljnih količnika opasnosti (THQ) i indeksa opasnosti (HI). THQ je bio niži od 1 za sve dobne skupine, što ukazuje da je za sarajevsko stanovništvo još uvijek sigurno jesti jestivo bilje, voće i povrće koje se nudi na tržnicama.

Ključne riječi*: teški metali, zdravstveni rizik, procijenjeni dnevni unos, Sarajevo, jestive biljke.*

INTERMOLECULAR INTERACTIONS IN COMPLEX SYSTEMS “POLYAMIDE-SILICA GEL”: THE QUANTUM-CHEMICAL INTERPRETATION

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O. Kabat


O. Chigvintseva


S. Belošević

ABSTRACT:
The paper presents the results of quantum-chemical studies of polymer composite materials based on aromatic polyamide phenylon C1 filled with silica gel. The initial compounds recreating the structure features of monomer units of macromolecules are given. Theoretical models of complexes with hydrogen bonds describing the most probable interactions of the polymer matrix with the filler are proposed. The adequacy of the structures was confirmed by the results of IR spectroscopy. It is established that the chemical interaction of polymer molecules with the filler is carried out by forming strong hydrogen bonds with the participation of bridged amide groups interacting with some active hydroxyls on the surface of silica gel.

Keywords: *polymers, polymer composite materials (PCM), polymer matrix, quantum-chemical interpretation.*

APPLICATION OF LIFE CYCLE ASSESSMENT IN INVESTIGATION OF ŠEHER-ĆEHAJINA ĆUPRIJA (A MASONRY BRIDGE)

PRIMJENA PROCJENE ŽIVOTNOG CIKLUSA U ANALIZI ŠEHER-ĆEHAJINE ĆUPRIJE (ZIDANI MOST)

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Naida Ademović

ABSTRACT:
Bridges represent the vein of the transportation network and their constant maintenance is of crucial importance for the proper functioning of the country. Consumption of a large amount of material and energy is marked by the construction or rehabilitation of bridges. The old masonry bridges in the city of Sarajevo besides being a landmark, connect the two sides of the city across river Miljacka. These bridges overpassed 100 years and maintenance is an important issue. Masonry arch bridges thought history have shown their small need for maintenance on one hand while being highly sustainable long-lasting structures. Life Cycle Assessment (LCA) has been identified as a powerful tool which takes into account economic, environmental and socio-cultural impacts. This paper provides information and elaborates reasons for taking into account environmental aspects in the bridge management system.

Keywords: *masonry arch bridge, pedestrian bridge, life cycle assessment, maintenance, environmental impact*

REZIME:
Mostovi predstavljaju žilu kucavicu transportne mreže i njihovo stalno održavanje je od presudne važnosti za pravilno funkcionisanje zemlje. Potrošnja velike količine materijala i energije obilježena je izgradnjom ili sanacijom mostova. Stari zidani mostovi u gradu Sarajevu, osim što su orijentir, povezuju dvije strane grada Sarajeva preko rijeke Miljacke. Radi se o mostovima koji su stari preko sto godina i njihovo pravovremeno održavanje je važno pitanje. Istorija je pokazala da je potreba za održavanjem zidanih lučnih mostova mala, a isti predstavljaju visoko održive dugotrajne objekte. Procjena životnog ciklusa (LCA) prepoznata je kao moćno sredstvo koje uzima u obzir ekonomske, okolišne i socio-kulturne utjecaje. Ovaj rad pruža informacije i elaborira razloge za uzimanje u obzir ekoloških aspekata u sistemu upravljanja mostom.

Ključne riječi: *zidani lučni most, pješački most, procjena životnog ciklusa, održavanje, utjecaj na okoliš*

SCAN-TO-BIM PROCEDURE FOR AN OLD INDUSTRIAL PLANT

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[2]Department of Civil, Building and Environmental Engineering, University of Naples Federico II, Italy


C. G. Guida


A. Di Filippo


P. D'Agostino

ABSTRACT:
The work presentsanefficient solution, based on integrating different data sources, for the digitization and modeling of anold structure with the HBIM methodology. Itdeal swithsurveyissues, focusing on the various design approaches betweenparametric and not-parametric architectural elements. A procedural pipeline is formalized for data acquisition, processing, and generating a complete model for a disused industrialplant, formerlyused for tobacco processing andlocatedinthecityofBattipaglia, Italy. The most difficultchallengeis to obtain parametric objects of complex geometries. The result sobtainedcorroborate witht herobustness and accuracy of the proposed strategy.

Keywords: *Existing Industrial Plants, Point Cloud, restoration, 3D digitisation, SLAM, parametrisation.*

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1. INTRODUCTION

Many areas of technology and science are engaged in the strategic task of digitisation. Creating a digital model of an object, such as a vehicle or a building, makes the design or redesign process more effective and efficient, saving time and money.In the field of the civil engineering, the Building Information Modelling (BIM) approach has become for many years an essential tool for the design of new structures[1]. The core of the method is a digital model of the structure to which is linked to every data connected to: materials, geometrical and mechanical proprieties, piping and electrical systems, devices for structure control, apparatus for the Structure Health Monitoring (SHM) and so on. This method allows the designer to manage the whole process from design to construction and management of new or existent civil structures. For the last ones we use the acronym Heritage Building Information Modelling (HBIM)[2, 3]. The biggest challenge of HBIM modelling is the creation of intelligent parametric objects, to which they assign the collected information, capable of representing the unique and singular shapes and geometries of historic architecture[4].

WIND SPEEDDEFINING METHODOLOGY APPLIED IN BOSNIA AND HERZEGOVINA

METODOLOGIJA ODREĐIVANJA BRZINA VJETRA PRIMJENJENA U BOSNI I HERCEGOVINI

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ABSTRACT:
In and through this paper we analysed and summarized methodology for defining of wind speedfor wind load calculationin Bosnia and Herzegovina. Historical data for wind in Bosnia and Herzegovina are analysed with focus on type of instruments and mechanisms of measurements in period of 1961.-1990. in system of hydrometeorological service in BiH. Detailed approachon system and methodology of measurement, collection and quality control of wind data gives as full picture for calculation of wind load.

Keywords: *Wind load, wind speed, measurement methodology and regulations, Bosnia and Herzegovina*

SAŽETAK:
U ovom radu smo analizirali i saželi metodologiju za određivanje brzine vjetra za proračun opterećenja vjetrom u Bosni i Hercegovini. Istorijski podaci za vjetar u Bosni i Hercegovini analizirani su sa naglaskom na vrstu instrumenata i mehanizme mjerenja u periodu 1961.-1990. u sistemu hidrometeorološke službe u BiH. Detaljan pristup sistemu i metodologiji mjerenja, načinu prikupljanja kao i kontrole kvaliteta podataka o vjetru daju potpunu sliku o podacima koji se koriste za proračun opterećenja vjetrom.

Ključne riječi: *opterećenjevjetrom, brzinavjetra, metodologijainormativimjerenja, Bosna i Hercegovina*

SATELLITE THERMOGRAPHY OF CITIES AND POSSIBILITIES OF INFLUENCE ON TEMPERATURE REDUCTION

SATELITSKA TERMIČKA SNIMANJA GRADOVA I MOGUĆNOSTI UTICAJA NA SMANJENJE TEMPERATURE

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N. Tuno


J.Topoljak


M. Đidelija

ABSTRACT:
Urbanization has been one of the most dominant social trends in the last 50 years. The phenomena of atmospheric changes due to urbanization are becoming more expressed in big cities worldwide. One of the most striking phenomenon is the appearance of the urban heat islands. The development of remote sensing based on satellites and sensors sensitive to different parts of the electromagnetic spectrum, has enabled a new and easier way to track the phenomenon of urban heat islands. Commercial satellite systems, such as Landsat and appropriate software greatly contributed to the application of remote sensing methods in the study of the phenomenon of urban heat islands. This paper describes the procedure for determining the temperature of some world cities with special reference to Sarajevo, based on Landsat images obtained by remote sensing. Some of the possibilities that can influence the reduction of temperature in cities will also be explained.

Keywords: *Remote sensing, urban heat island, surface urban heat island, Landsat, Sarajevo*

REZIME:
Urbanizacija predstavlja jedan od najizraženijih društvenih trendova posljednjih 50 godina. Fenomeni promjene atmosfere uslijed urbanizacije postaju sve više izraženiji u velikim svjetskim gradovima. Jedan od najizraženijih fenomena predstavlja pojava urbanih toplotnih ostrva. Razvoj daljinske detekcije zasnovane na satelitima i senzorima osjetljivih na različite dijelove elektromagnetnog spektra, omogućio je novi i lakši način praćenja fenomena urbanog toplotnog ostrva. Komercijalni satelitski sistemi, kao što je Landsat i odgovarajući softveri u mnogome su doprinijeli primjeni metode daljinske detekcije u proučavanju fenomena urbanih toplotnih ostrva. U radu je opisan postupak određivanja temperature područja nekih svjetskih gradova sa posebnim osvrtom na Sarajevo, a na osnovu Landsat snimaka dobijenih metodom daljinskih istraživanja. Također će biti objašnjene neke od mogućnosti kojima je moguće uticati na smanjenje temperature u gradovima.

Ključne riječi: *Daljinska istraživanja, urbano toplotno ostrvo, površinsko urbano toplotno ostrvo, Landsat, Sarajevo*

DEVELOPMENT AND TESTING OF MICROPOROUS HYDROPHOBIC AND OLEOPHOBIC MEMBRANES
RAZVOJ I ISPITIVANJE MIKROPOROZNIH HIDROFOBNIH I OLEOFOBNIH MEMBRANA

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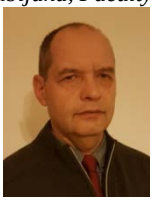
Mario Krzyk


Darko Drev

ABSTRACT:
Some personal protective equipment should have hydrophobic and oleophobic properties. The use of equipment of such characteristics provides good protection against precipitations and contamination by microorganisms. Hydrophobic microporous materials are permeable to steam and gas molecules (O_2, CO_2, N_2, etc.) but not permeable to droplets or aerosols of liquids (water, etc.) and particles of dust and microorganisms above certain size. However, filter membranes must have the ability to retain solid particles up to certain diameter. Composites based on polytetrafluoroethylene (PTFE) membranes, in which the pore size ranges from 0.1 to 0.01 mm, are mostly used as industrial membranes. As such materials are oleophobic, various impurities do not hold on it, what is also very important.For industrial needs, PTFE membranes are most often laminated to certain textile basis. The paper presents the results of development and testing of some PTFE membranes that could be used in the production of industrial membranes.Proposals of production procedures of PTFE industrial membranes and results of performed tests of their characteristics are presented. ...
Keywords: *PTFE membrane production, lamination, oleophobic, hydrophobic, particle leakage*

SAŽETAK:
Lična zaštitna oprema bi trebala imati hidrofobna i oleofobna svojstva. Upotreba opreme, koja posjeduje takve karakteristike, pruža dobru zaštitu od atmosferskih utjecaja i zagađenja mikroorganizmima. Hidrofobni mikroporozni materijali su propusni za molekule pare i plinova (O_2, CO_2, N_2, itd.), ali nisu propusni za kapljice ili aerosole tečnosti (voda, itd.), te čestice prašine i mikroorganizme, iznad određene veličine. Međutim, filtracijske membrane moraju imati sposobnost zadržavanja čvrstih čestica do određenog promjera. Kompoziti zasnovani na bazi politetrafluoroetilenskih (PTFE) membrana, u kojima se veličina pora kreće od 0,1 do 0,01 mm, uglavnom se koriste kao industrijske membrane. Kako su ti materijali oleofobni, na njima se ne zadržavaju razne nečistoće, što je od velikog značaja pri njihovoj upotrebi. Za industrijske potrebe se PTFE membrane najčešće laminiraju na određene tekstilne podloge. U radu su predstavljeni rezultati razvoja i ispitivanja nekih PTFE membrana koje bi se mogle koristiti u proizvodnji industrijskih membrana. Predstavljeni su prijedlozi proizvodnih postupaka PTFE industrijskih membrana i rezultati izvedenih ispitivanja njihovih karakteristika. ...
Ključne riječi: *proizvodnja PTFE membrana, laminiranje, oleofobnost, hidrofobnost, propuštanje čestica*

BETWEEN TECHNOLOGY AND ORNAMENT IN CONTEMPORARY BUILDING ENVELOPE

IZMEDJU TEHNOLOGIJE I ORNAMENTA U OBLIKOVANJU SAVREMENIH OMOTAČA OBJEKATA

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ABSTRACT:
The ornament iscontinuouslypresent throughout the long history of architecture. Principles of sustainability and energy efficiency, increasing dimensions of certain typological groups of buildings (the phenomenon of "bigness"), the need to control daylight and thermal comfort in buildings, as well as increasingly advanced technologies and materials make the ornament, now more of a structural character, becomes an indispensable element in the contemporary architecture.This paper suggests the evolution and generation of different factors explaining reasons for ornament resistance in contemporary architecture, pointing to the close connection between the structural nature of ornament, energy efficiency and the application of modern technologies(double skin, PTFE, kinetic, interactive, tensile, media, homeostatic, green facades, etc.).

Keywords: *energy efficiency, ornament, facade, building envelope, contemporary architecture*

REZIME:
Ornament jekontinuirano prisutan kroz dugu istoriju arhitekture. Principi održivosti i energetske efikasnosti, sve veće dimenzije određenih tipoloških grupa objekata (fenomen "bigness"), potreba za kontrolom dnevne svjetlosti i toplotnog komfora u objektima, kao i sve naprednije tehnologije i materijali čine da ornament, sada uglavnomstrukturalnog karaktera, postaje nezamjenjiv element u suvremenoj arhitekturi. Ovaj rad ukazuje na različite faktore koji objašnjavaju razloge otpornosti postojanja ornamenta u savremenoj arhitekturi, sa posebnim fokusom na blisku vezu između njegove strukturalne prirode, energetske efikasnosti i primjene modernih tehnologija (dvostruke, PTFE, kinetičke, interaktivne, tekstilne, medija, homeostatičke, zelene fasade, itd.).

Ključne riječi: *energetska efikasnost, ornament, fasada, omotač objekta, savremena arhitektura*

REAL-TIME INTELLIGENT INFORMATION SYSTEMS TO SUPPORT MORE EFFICIENT WORK OF CONSTRUCTION COMPANIES

INTELIGENTNI INFORMACIONI SISTEMI U REALNOM VREMENU KAO PODRŠKA EFIKASNIJEM RADU GRAĐEVINSKIH PREDUZEĆA

Mladen Radivojević[1], Merima Šahinagić-Isović[2], Muharem Kozić[3], Davor Radivojević[4]
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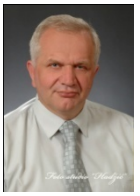
M. Radivojević


M. Šahinagić-Isović


M. Kozić


D. Radivojević

ABSTRACT:
In this paper, we deal with intelligent information systems that can provide the necessary information and knowledge in real time for more efficient work and decision-making in a construction company. The basis of such an information system is a data warehouse, and in this paper we suggest some of the ways to fill the data warehouse. In order to be able to get some of the necessary data needed for more efficient work and decision-making, we suggest the use of unmanned aerial vehicles (UAV), the Internet of things (IoT) and the 5G network. Based on the conducted analyses, we propose the use of intelligent information systems in real time, which can provide construction companies not only with more efficient work and decision-making, but also with a competitive advantage.

Keywords: *data storage, construction companies, UAV, Internet of Things.*

REZIME:
U ovom radu bavimo se inteligentnim informacionim sistemima koji u realnom vremenu mogu obezbjediti neophodne informacije i znanja za efikasniji rad i odlučivanje u građevinskom preduzeću. Osnova takvog informacionog sistema je skladište podataka i u ovom radu ćemo predložiti neke od načina za punjenje skladišta podataka. Da bi mogli doći do jednog dijela neophodnih podataka potrebnih za efikasniji rad i odlučivanje, u radu ćemo predložiti korištenje dronova, internet stvari i 5G mreže za dolaženje do njih. Na osnovu provedenih analiza predložićemo korištenje inteligentnih informacionih sistema u realnom vremenu, a koji građevinskim preduzećima mogu obezbjediti ne samo efikasniji rad i odlučivanje već i konkurentsku prednost.

Ključne riječi: *skladišta podataka, građevinska preduzeća, dronovi, internet stvari.*

URBAN STORMWATER MANAGEMENT – NEW CHALLENGES

UPRAVNJANJE URBANIM OBORINSKIM VODAMA-NOVI IZAZOVI

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S. Šuvalija


E. Hadžić


H. Milišić

ABSTRACT:
Population increase results in more urbanization, more impervious area and less infiltration and greater flood peak and runoff. Problems become more critical due to more severe and frequent flooding likely caused by climate change, socio-economic damage, population affected, public outcry and limited funds. Also, stormwater runoff is a leading cause of non-point source pollution in urbanizing areas, and runoff effects will be exacerbated by climate's changing patterns of precipitation. These new impacts and consequences on urban runoff and its pollution ask for adaptation by new approach of urban stormwater management. This article presents basic principles of conventional and new approach of urban (storm)water management. Application of new approach is given through some examples of SWICH (Sustainable Water Management Improvements Tomorrows Cities Health) project.

Keywords: *urbanization, climate changes, stormwater management, „green“ technologies, SWICH project*

REZIME:
Povećanje stanovništva rezultira većom urbanizacijom, nepropusnijim područjem i manjom infiltracijom te većim vršnim oticanjem i poplavama. Problemi postaju kritičniji zbog ozbiljnijih i češćih poplava koje su vjerojatno uzrokovane klimatskim promjenama, socijalno-ekonomskom štetom, pogođenim stanovništvom, negodovanjem javnosti i ograničenim sredstvima. Također, oborinsko otjecanje vodeći je uzrok difuznog zagađenja u urbanim sredinama, a učinke otjecanja pogoršat će klimatski promjenjivi obrasci padavina. Ovi novi utjecaji i posljedice na urbano otjecanje i njegovo zagađenje zahtijevaju prilagodbu novim pristupom upravljanju urbanim oborinskim vodama. Ovaj članak predstavlja osnovna načela konvencionalnog i novog pristupa gospodarenju urbanim (oborinskim) vodama. Primjena novog pristupa data je kroz neke primjere projekta SWICH (projekta održivog upravljanja vodama za poboljšano sutrašnje zdravlje gradova).

Ključne riječi: *urbanizacija, klimatske promjene, upravljanje oborinskim vodama, „zelene“ tehnologije, SWICH projekat*

SPREADSHEET SOLUTION FOR COST-OPTIMAL CONSTRUCTION SCHEDULING THROUGH UTILIZATION OF INTERNET-BASED SOLVERS

TROŠKOVNO OPTIMALNOPLANIRANJE GRADNJEPUTEM PRORAČUNSKIH TABLICA KROZ KORIŠTENJE INTERNETSKIH RJEŠAVATELJA

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B. Dasović


U. Klanšek

ABSTRACT:
In this paper, a spreadsheet solution for cost-optimal construction scheduling by using internet-based solvers is presented. The basic idea is to develop an optimization model within the spreadsheet, arrange all input parameters and run the optimization process on a web-based service for solving numerical optimization problems. To demonstrate the benefits of the proposed approach, an example is given. The problem of cost-optimal project scheduling is modeled in MS Excel and then solved by its add-in, called OpenSolver. The add-in converts the optimization problem into an algebraic modeling language formulation and forwards the model to NEOS (Network-Enabled Optimization System). The optimization results are automatically returned to MS Excel and presented in the form of a Gantt chart.

Keywords: *construction, project management, optimization, spreadsheet modeling, scheduling, internet-based solvers*

SAŽETAK:
U ovom radu predstavljeno je troškovno optimalno planiranje gradnje putem proračunskih tablica kroz korištenje internetskih rješavatelja. Osnovna ideja je bilo razviti optimizacijski model unutar proračunske tablice, urediti sve ulazne parametre i pokrenuti postupak optimizacije na internetskom poslužitelju za rješavanje optimizacijskih problema. U radu su na primjeru demonstrirane prednosti ovakvog pristupa. Problem troškovno optimalnog vremenskog planiranja modeliran je u MS Excelu, a zatim riješen pomoću njegovog dodatka – OpenSolver.Navedeni dodatak pretvara optimizacijski problem u formulaciju algebarskog modelirnog jezika i model prosljeđuje na NEOS (mrežni optimizacijski sustav). Rezultati optimizacije automatski se vraćaju u MS Excel gdje se i prikazuju u obliku gantograma.

Ključne riječi: *građevinarstvo, projektni menadžment, optimizacija, modeliranje u proračunskim tablicama, planiranje, internetski rješavatelji*

SUSTAINABLE COMPOSITE MATERIALS WITH INDUSTRIAL WASTE RED MUD – AN OVERVIEW

ODRŽIVI KOMPOZITNI MATERIJALI SA INDUSTRIJSKIM OTPADOM CRVENIM MULJEM - PREGLED

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M. Ćećez


M. Šahinagić-Isović


F. Ćatović

ABSTRACT:
Red mud is a by-product in Bayer's process of alumina production. Favorable chemical composition and particle size justifies research for further utilization of this waste material. This work aims to present overview of research concerning utilization of red mud as partial replacement for cement in mortars and concrete. Although it can not be fully considered as artificial pozzolan, red mud is interesting candidate for researches worldwide. Since cement industry contributes greatly to environment pollution, partial replacement of raw material or cement itself would reduce its' impact. Technology for production of mortar and concrete with red mud addition would contribute to development of sustainable and eco-friendly materials.

Keywords: *sustainability, industrial waste, red mud, mortar, concrete*

REZIME:
Crveni mulj je nusprodukt u Bayerovom postupku dobivanja glinice. Povoljan hemijski sastav i veličina čestica opravdava istraživanja ovog materijala za daljnje korištenje. Ovaj rad ima za cilj da prikaže pregled istraživanja ovog materijala kao djelimične zamjene za cement kod maltera i betona. Iako se ne može u potpunosti smatrati vještačkim pucolanom, crveni mulj je zanimljiv kandidat za svjetske istraživače. Kako je cementna industrija jedan od najvećih zagađivača, djelimična zamjena sirovina ili samog cementa bi smanjila njegov uticaj. Tehnologija proizvodnje maltera i betona sa crvenim muljem doprinijela bi razvoju održivog ekološkog materijala.

Ključne riječi: *održivost, industrijski otpad, crveni mulj, malter, beton*

COMPARISON OF THE STEEL N AND V LATTICE STRUCTURE OF THE HALL BY STRUCTURAL ANALYSIS

USPOREDBA ČELIČNE N I V REŠETKASTE KONSTRUKCIJE HALE STATIČKOM ANALIZOM

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M. Horozović

ABSTRACT:
The subject of the paper is the comparison of two different types of lattice, N and V steel lattice construction of the hall in Sarajevo. In this paper, the type of lattice is analyzed with the aim of defining a better solution for the hall from the static and economically aspect. Static analysis was done in the Autodesk Robot Structural Analysis Professional 2019 program, and a 2D calculation model was used. The analysis of the load on the structure was done in accordance with Eurocode 1, and the sizing of the bars was done in accordance with Eurocode 3.

Keywords: *hall, Eurocode 1, Eurocode 3, N and V lattice structure*

SAŽETAK:
Predmet rada je poređenje dvije različite vrste rešetke, N i V čelične rešetkaste konstrukcije hale uSarajevu. U ovom radu je analizirana vrsta rešetke sa ciljem definisanja boljeg rješenja za halu sa statičkog aspekta i ekonomskog aspekta. Statička analiza je urađena u Autodesk Robot Structural Analysis Professional 2019 programu, a korišten je 2D model proračuna. Analiza opterećenja na konstrukciju je urađena u skladu sa Eurocode 1, a dimenzionisanje štapova je urađeno u skladu sa Eurocode 3.

Ključne riječi: *hala, Eurocode 1, Eurocode 3, N i V rešetke*

FLOODPLAIN MAPPING USING HEC-RAS AND LiDAR DATA A CASE STUDY OF THE BISTRICA RIVER BASIN, B&H

KARTIRANJE PLAVNIH PODRUČJA PRIMJENOM HEC – RASa I LIDAR PODATAKA - PRIMJER SLIVA RIJEKE BISRTICE, BiH

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H. Milišić


E. Hadžić


S. Šuvalija


E. Jahić

ABSTRACT:
This paper elaborates numerical simulations of flow in natural watercourses. Numerical simulations were done for the Bistrica River (B&H) at the length of the considered stream about 4 km. The establishment, calibration and validation of the model was carried out in the HEC-RAS software package based on the available data. At the end the goal was to obtain flood hazard maps based on a calibrated and verified numerical model. Flood waves of return periods of 20, 50 and 100 years were considered. For these events, flood maps were obtained showing the distribution of water depths and velocities using the ArcGIS and HEC-GeoRAS software tools. The results of numerical modeling of the flow and simulation of flood waves for the Bistrica River of the different occurrence rank, using the HEC RAS model have shown that its application is quite justified and it can be used as a good tool in future activities related to flood forecasting and prevention.

Keywords: *Flood modeling, hazard maps, Vrbas River Basin, HEC RAS, HEC-GeoRAS*

REZIME:
Ovaj rad se bavi numeričkim simulacijama tečenja u prirodnim vodotocima. Numeričke simulacije rađene su za rijeku Bistricu (BiH) na dužini razmatranog toka oko 4 km. Uspostava, kalibracija i validacija modela izvršena je u programskom paketu HEC-RAS na osnovu dostupnih podataka i podloga. Na kraju, cilj je bio dobiti karte opasnosti od poplava na osnovu kalibriranog i provjerenog numeričkog modela. Razmatrani su poplavni valovi povratnih perioda od 20, 50 i 100 godina. Za ove događaje dobivene su karte poplava koje prikazuju raspodjelu dubina i brzina vode pomoću softverskih alata ArcGIS i HEC-GeoRAS. Rezultati numeričkog modeliranja protoka i simulacije poplavnih valova za rijeku Bistricu različitog ranga pojave, koristeći HEC RAS model, pokazali su da je njegova primjena sasvim opravdana i može se koristiti kao dobar alat u budućim aktivnostima vezanim uz predviđanje i prevencija poplava.

Ključne riječi: *Modeliranje poplava, karte opasnosti, sliv rijeke Vrbas, HEC RAS, HEC-GeoRAS*

APPLICATION OF JOINTS IN MODERN AND TRADITIONAL CONSTRUCTION

PRIMJENA SPOJEVA U MODERNIM I TRADICIONALNIM DRVENIM KONSTRUKCIJAMA

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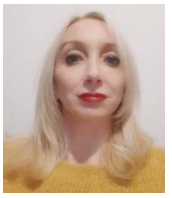
S. Klarić


V. Simonović

ABSTRACT:
In the age of accelerated advancement of technology and use of innovative and contemporary materials, the application of ecological and green materials was forgotten. These materials were completely ignored and rejected by the past century. However, for the past 20 years, when environmental awareness comes to light, the application of nature-friendly materials is reviving again. In the Bio-based Student Pavilion project made in Bosnia and Herzegovina, wood as natural materials is used for load-bearing construction. In the traditional way of constructing, the wooden element connections were often accomplished by the so-called carpenter's connections that excluded the use of metal fittings. After shortly presentation of the connections in the wooden structures, the advantages and disadvantages of connections with or without metal fittings are analysed.

Keywords: *connections with or without metal fittings; wooden structures, traditional and modern structures, bio-based pavilion*

REZIME:
U doba ubrzanog napretka tehnologije i upotrebe inovativnih i savremenih materijala, primena ekoloških i zelenih materijala bila je zaboravljena. U proteklom vijeku ovi materijali su bili potpuno ignorisani i odbačeni. Međutim, u posljednjih 20 godina, kada svijest o zaštiti okoliša izlazi na vidjelo, primjena prirodno prihvatljivih materijala ponovo oživljava. U projektu Bio-based studentskog paviljona u Bosni i Hercegovini koristi se drvo kao prirodni materijal za nosive konstrukcije. U tradicionalnom načinu gradnje, veze od drvenih elemenata često su se ostvarivale tzv. stolarskim vezama koje su isključivale upotrebu metalnih spojeva. Nakon kratkog prikaza veza u drvenim konstrukcijama, analiziraju se prednosti i nedostaci takvih veza sa ili bez metalnih okova.

Ključne riječi: *spojevi sa ili bez metalnih veza, drvene konstrukcije, tradicionalne i moderne konstrukcije, bio-based paviljon*

AGRITECH – POSSIBILITIES FOR WOMEN ECONOMIC EMPOWERMENT IN BOSNIA AND HERZEGOVINA

AGRITEH – MOGUĆNOSTI EKONOMSKOG OSNAŽIVANJA ŽENA U BOSNI I HERCEGOVINI

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M. Šestić


Z. Rahimić


M. Bičo Ćar


A. Pilav-Velić

ABSTRACT:
Agritech is offering new energy into agriculture, since digital technologies are revolutionising itby providing improved access to inputs, finance, markets and weather information. The barriers that women face in agribusiness can be significantly reduced by digital technology and therefore question could be raised - does agritech has the potential to facilitate women's economic empowerment with the right policies and programmes in place? In this article we will argue this question in general, yet further focusing on specific context of Bosnia and Herzegovina. According to official data 16% of the total number of working women in B&H (2020)are employed in agricultural, with estimates of a large number of women whose activities in agriculture are informal. Our intention is to domesticate chances for agritech potentials of economic empowernment for women in B&H, implying its long-term efects on the overall economic development of the country.
Keywords: *Agritech, digital technologies, women in agribusiness, women's economic empowerment, Bosnia and Herzegovina.*

SAŽETAK:
Agriteh pruža novu energiju poljoprivredi, jer digitalne tehnologije unose revoluciju u tu oblast pružanjem boljeg pristupa resursima, finansijama, tržištima i informacijama o vremenskim uslovima. Primjenom digitalnih tehnologija bi seznačajno mogle smanjiti barijere sa kojima se suočavaju žene u agrobiznisu, te se stoga može postaviti pitanje - da li agriteh nudi potencijal za ekonomsko osnaživanje žena primjenom odgovarajućih politika i programa? U ovom ćemo članku raspravljati o ovom pitanju uopšteno, ali se i fokusirati na specifičan kontekst Bosne i Hercegovine. Prema službenim podacima 16% od ukupnog broja zaposlenih žena u BiH (2020) angažovano je u poljoprivredi, sa procjenom o značajnom broju žena čije su poljoprivredne aktivnosti neformalne prirode. Naša namjera je upoznati mogućnosti agriteh potencijala ekonomskog osnaživanja žena u BiH, implicirajući njegove dugoročne učinke na ukupan ekonomski razvoj zemlje.
Ključne riječi: *Agriteh, digitalne tehnologije, žene u agrobiznisu, ekonomsko osnaživanje žena, Bosna i Hercegovina*

ANALYSIS OF DYNAMICS AND MODELS OF INNOVATIVE DEVELOPMENT OF FEDERAL DISTRICTS OF RUSSIA IN THE CONTEXT OF NEO-INDUSTRIAL CHALLENGES

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M. S. Starikova


Y. A. Doroshenko


V. N. Riapuhina

ABSTRACT:
The purpose of this article is to analyze the dynamics and identify models of innovative development of Russian regions to classify them and determine the trajectory of further development. General economic, market, investment, organizational, personnel, and industry trends in the innovative development of the Russian region are systematized to achieve this goal. Technological innovation cost and innovative-product volume relation have been asses, in the federal districts of the Russian Federation. Indicators of industrialization and innovation have been identifying in the region. The relationship between industrialization level and the ability to create an innovative product has been investigating. The structure of Russian regions considering the type of used innovative development model is relatively stable and unsatisfactory. Only one-third of Russian regions can be considered innovatively active. For industrially developed regions that apply the neo-industrial innovative development model or the model of innovative stagnation, noticed is a significant dependence on innovation performance. The analysis carried out indicates the lack of the required balance between industrial development potential and the innovative productivity of Russian regions, which may be due to the low efficiency of the applied industrial policy measures.

Keywords: *innovation, industry, regional management, innovative development, innovative stagnation, non-industrial development.*

MAGNITUDE OF COVID 19 PANDEMIC IMPACT ON ENTREPRENEURIAL COMPANIES' OPERATIONS IN DEVELOPING COUNTRIES

MAGNITUDA UTICAJA PANDEMIJE COVIDA 19 NA POSLOVANJE PREDUZETNIČKIH KOMPANIJA U ZEMLJAMA U RAZVOJU

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M. Šestić


A. Hrnjić


S. Softic

ABSTRACT:
Pandemic impact of COVID 19 virus pandemic on entrepreneurs' business operation is unquestionable. Yet there are a number of questions about different direct and indirect pandemic impact on entrepreneurial businesses. This paper will present explanation of magnitude of the entrepreneurial businesses' changes caused by COVID 19 crisis on random sample of 202 entrepreneurial companies in Bosnia and Herzegovina, with focus on analysing and recognizing the main COVID 19 pandemic impacts.It is exceptionally important to recognize the pandemic crisis impacts on the business of entrepreneurs with a scope to create an empirically valuable basis for focused action of all stakeholders in the limited resources context in order to increase entrepreneurs resilience, not only in pandemic crisis circumstences, but in other similar business situations also.

Keywords: *COVID 19 Pandemic Crisis, Entrepreneurial Companies, Business Changes, Bosnia and Herzegovina*

SAŽETAK:
Utjecaj pandemije virusa COVID 19 na poslovanje preduzetnika je neupitan. Ipak, postoji niz pitanja o različitim direktnim i indirektnim uticajima pandemije na preduzetničko poslovanje. U ovom radu će biti predstavljeno objašnjenje magnitude promjena u preduzetničkom poslovanju, izazvanih krizom COVID 19, na slučajnom uzorku od 202 preduzetnička preduzeća u Bosni i Hercegovini, s fokusom na analizi i prepoznavanju temeljnih uticaja pandemije COVID 19. Izuzetno je važno prepoznati krizne utjecaje pandemije na poslovanje preduzetnika s ciljem stvaranja empirijski vrijedne osnove za fokusirano djelovanje svih interesnih grupa u kontekstu ograničenih resursa, ne samo kako bi se povećala otpornost preduzetnika u okolnostima pandemijske krize, već i u drugim sličnim poslovnim situacijama.

Ključne riječi: *COVID 19 pandemijska kriza, preduzetničke kompanije, promjene u poslovanju, Bosna i Hercegovina*

GENDER DIFFERENCES OF ENTREPRENEURIAL BUSINESS ATTITUDES TO THE CRISIS CAUSED BY THE PANDEMIC OF COVID 19: EVIDENCE FROM BOSNIA AND HERZEGOVINA

RODNE RAZLIKE U PREDUZETNIČKOM PRISTUPU POSLOVANJU USLJED KRIZE UZROKOVANE PANDEMIJOM COVID 19: PRIMJER BOSNE I HERCEGOVINE

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M. Šestić


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S. Softic


A. Hrnjić

ABSTRACT:
Crisis caused by COVID 19 pandemic is backward step for efforts on path towards gender equality (WEF 2020). Knowing that female entrepreneurs face serious obstacles, especially in less stimulating context, the question arises – is there a gender difference in the resilience of entrepreneurial companies during the crises caused by COVID 19 pandemic. Article will offer rare evidence on the (non)existence of a genderdifferences in sense of entrepreneurial companies resilience, as a part of a broader study of the consequences of the pandemic crisis on entrepreneurial businesses in B&H. Authors will give insights for all stakeholders with a focus on gender sensitivity when formulating policies to overcome the impact of the crisis, but with a broader contribution to gender aspects of entrepreneurial researches also.

Keywords:*COVID 19 pandemic, gender differences, business resilience, Bosnia and Herzegovina*

SAŽETAK:
Kriza izazvana pandemijom COVID 19 korak je unatrag u naporima na putu ka rodnoj ravnopravnosti (WEF 2020). Znajući da se preduzetnice suočavaju s ozbiljnim preprekama, posebno u manje poticajnom kontekstu, postavlja se pitanje - postoji li rodna razlika u otpornosti preduzetničkih kompanija tokom krize izazvane pandemijom COVID 19. Članak će ponuditi rijetke dokaze o (ne)postojanju rodnih razlika u smislu otpornosti preduzetničkih kompanija, kao dio šire studije o posljedicama krize usljed pandemije na preduzetničko poslovanje u BiH. Autori će radom dati uvid svim interesnim javnostima sa naglaskom na rodnu osjetljivost prilikom formulisanja politika za prevladavanje krize, ali će dati i širi doprinos rodnim aspektima preduzetničkih istraživanja.

Ključne riječi: *COVID 19 pandemija, rodne razlike, otpornost poslovanja, Bosna i Hercegovina*

ANALYSIS OF EFFECTIVE CRISIS MANAGEMENT AND CRISIS COMMUNICATION IN PUBLIC SECTOR ORGANIZATIONS

ANALIZA EFEKTIVNOG UPRAVLJANJA KRIZOM I KRIZNOG KOMUNICIRANJA U ORGANIZACIJAMA JAVNOG SEKTORA

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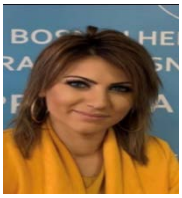
M. Tanović


Đ. Šašić


A. Ajdinović


E. Čizmić

ABSTRACT:
The crisis is producing different government responses. Poor administrative governance has proven to be a key factor in institutional weakness during the crisis in a large number of countries. This paper considers the needs of introduction of managerial patterns and practices in public sector organizations and proposes a conceptual approach that synthesizes an effective crisis management and crisis communication process designed for the public sector. The purpose of this paper is to present a successful model of institutional and crisis communication and crisis management on the example of Bosnia and Herzegovina, and the role of key entity institutions in responding to the crisis as a threat to public health, which was presented based on research. The paper analysis a data collection model and measurement system, with a discussion of the implications of this research on the improvement of knowledge and practice in the public sector.

Keywords*: COVID 19 crisis, management, crisis communication, public sector*

REZIME:
Kriza proizvodi različite odgovore vlada. Loše administrativno upravljanje pokazalo se ključnim faktorom institucionalnih slabosti tokom krize u velikom broju zemalja. Ovaj rad razmatra potrebe uvođenja menadžerskih obrazaca i praksi u organizacije javnog sektora i predlaže konceptualni pristup koji sintetizira proces efektivnog upravljanja krizom i kriznog komuniciranja dizajniran za javni sektor. Svrha ovog rada je predstaviti uspješan model kriznog komuniciranja i upravljanja krizama na primjeru Bosne i Hercegovine kao i ulogu ključnih entitetskih institucija u odgovoru na krizu kao prijetnju javnom zdravlju, a koji je predstavljen na osnovu istraživanja. U radu je analiziran model prikupljanja podataka i mjerni sistem, uz raspravu o implikacijama ovog istraživanja na unapređenje znanja i prakse u javnom sektoru.

Ključne riječi*: COVID 19 kriza, menadžement, krizno komuniciranje, javni sektor*

THE ROLE OF LARGE TECH COMPANIES IN THE CAPITAL MARKET RECOVERY FROM THE COVID-19 CRISIS

ULOGA VELIKIH TEHNOLOŠKIH KOMPANIJA U OPORAVKU TRŽIŠTA KAPITALA OD COVID-19 KRIZE

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L. Dedovic

ABSTRACT:
This study aims to (1) critically analyze the measures imposed by the US government in the Covid-19 crisis in comparison with the measures from the Global Financial Crisis (GFC), to (2) assess the impact of the crisis on the US capital market and to (3) find out what is the role of large technology companies in the US stock market rebound. We find that in the Covid-19 crisis the US government responded faster, in more organized manner, and its interventions were of greater scale, compared to the measures imposed in the GFC. We find increased volatility of the S&P 500 Index in the period after the Covid-19 outbreak than before. Index performs better in the Covid-19 crisis compared to the GFC, with significantly lower volatility.The Covid-19 shock caused a "V-shaped" movement in the Index with quick fully recovery, while the general pattern during the GFC is "U-shaped", with prolonged recovery. We also find that the quick mid-term rebound of the S&P 500 Index in the Covid-19 crisis is more due to the strong performance and blooming stock prices of the six technology companies from the S&P 500 Index and less due to the actual recovery of the overall market. Implications are in increased risk associated with investments in S&P 500 Index replicating mutual funds.
Keywords: *Covid-19, Global financial crisis, S&P 500 Index, volatility, US, technology*

REZIME:
Ciljevi ove studije su (1) kritička analiza mjera vlade SAD-a u krizi Covid-19 u usporedbi s mjerama iz globalne finansijske krize (GFC), (2) analiza utjecaja krize na američko tržište kapitala, te (3) procjena uloge velikih tehnoloških kompanija u oporavku američkog tržišta kapitala.. Otkrivamo da je u krizi Covid-19 američka vlada reagirala brže, organiziranije i da su njezine intervencije bile veće razmjere u odnosu na mjere izrečene u GFC-u. Našli smo povećanu volatilnost indeksa S&P 500 u razdoblju nakon izbijanja Covid-19 nego prije. Indeks ima bolje performanse u krizi Covid-19 u odnosu na GFC, tesignifikatno nižu volatilnost.Kretanje indeksausljed Covid-19 šoka je u obliku slova V, s brzim potpunim oporavkom, za razliku od kretanja u obliku slova U tokom GFC, s produženim oporavkom. Brzi oporavak indeksa S&P 500 u krizi Covid-19 je više rezultat snažnih performansi i rasta cijena dionica šest tehnoloških kompanija iz indeksa S&P 500, nego općeg oporavka tržišta kapitala. Implikacije su u povećanomrizikuinvestiranja u uzajamne fondove koji repliciraju indeks S&P 500.
Ključne riječi: *Covid-19, globalna finansijska kriza, S&P 500 indeks, volatilnost, US, tehnologija*

THE PROCESS OF TECHNICIZING THE WORLD, TECHNOCULTURE AND TECHNOLOGY AS A MEDIUM

PROCES TEHNIZIRANJA SVIJETA, TEHNOKULTURA I TEHNOLOGIJA KAO MEDIJ

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H. Sofradžija


A. Alibegović


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M. Arifhodžić

ABSTRACT:
The omnipresence of new technologies is noticeable in all aspects of our everyday reality and overall social life. There is no doubt that the technology has reshaped the world and changed the society image, which initiated new themes for research. In the era of planetary technicization of the world, understanding a new emerging culture has to be the subject of serious contemplation, which “has changed the nature of human action” (Jonas). Technology changes the world appearance, also the way we see and experience the world. The historical shift in contemporary culture and deep transformation of all substantialities of life on the planet becomes one of the most important questions that appear for the man of our time.

Keywords: *technoculture, technology, society digitalization, technosphere, network society*

SAŽETAK:
Sveprisutnost novih tehnologija primjetna je u svim aspektima naše svakodnevne stvarnosti i ukupnog društvenog života. Nema sumnje da je tehnologija preoblikovala svijet i promijenila sliku društva, to pokreće nove teme za istraživanje. U dobu planetarnog tehniziranja svijeta mora biti predmetom ozbiljnog promišljanja razumijevanje nove kulture koja nastaje, koja je “izmijenila prirodu ljudskog djelovanja” (Jonas). Tehnolologija mijenja izgled svijeta, ali i način na koji mi gledamo i doživljavamo svijet. Povijesni okret u savremenoj kulturi i duboka transformacija svih sadržajnosti života na planeti postaje jedno od najvažnijih pitanja koja se postavljaju pred čovjeka našeg doba.

Ključne riječi: *tehnokultura, tehnologija, digitalizacija društva, tehnosfera, umreženo društvo*

ENTERPRISE-BASED SUPPORT TO INNOVATIVE ACTIVITIES

NA PODUZEĆU UTEMELJENA PODRŠKA INOVATIVNIM AKTIVNOSTIMA

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I. Domljan


V. Domljan

ABSTRACT:
To support its companies in becoming more efficient, innovative and competitive, Bosnia and Hercegovina (BiH)needs proper government's policy. Turning innovative ideas into products and services that create growth and jobs is very challenging for BiH as, inter alia, an innovation system and policy are not yet introduced. The innovation system and policy could be set in a way that the system and policy framework are established at the level of BiH and its entities while policies are designed and implemented at the regional or rather at the Cantonal level. That is in accordance with the constitutional set up of BiH and the EU rules on smart specialisation of regions. However, company networks which could express a common vision of future industrial upgrading are missing, particularly in relating to the issue of key factor endowments.
The paper discusses the issue of establishing and developing institutions and policy in BiH relating to innovation policy and proper support measures for innovative activities at the regional/Cantonal levelby applying value chain-centred approach.
Keywords: *technology, value chains, Bosnia and Herzegovina*

REZIME:
Kako bi podržala tvrtke da postanu efikasnije, inovativnije i konkurentnije, Bosna i Hercegovina (BiH) treba odgovarajuću javnu politiku. Pretvaranje inovativnih ideja u proizvode i usluge koji stvaraju rast i radna mjesta vrlo je izazovno za BiH, jer, između ostalog, još nisu uvedeni inovacijski sustav i politika. Mogu se uvesti na razini BiH i njenih entiteta,dok se politike osmišljavaju i provode na regionalnoj/kantonalnoj razini, što je sukladno ustavnom uređenju BiH i pravilima EU o pametnoj specijalizaciji regija. Međutim, nedostaje mreža tvrtki sposobnih izraziti zajedničku viziju u pogledu nadogradnje djelatnosti, posebno na temelju raspoloživosti faktora proizvodnje.
Razmatra se pitanje uspostave i razvoja institucija i politika u BiH vezano za inovacijske politike. te uvođenje odgovarajućih mjera potpore inovativnim aktivnostima na regionalnoj/kantonalnoj razini na temelju podrške utemeljene na lancu vrijednosti.

Ključne riječi*: tehnologija, lanci vrijednosti, Bosna i Hercegovina*

DETERMINANTS OF MARKET ORIENTATION OF BOSNIA AND HERZEGOVINA COMPANIES IN THE FOOD PROCESSING INDUSTRY

DETERMINANTE TRŽIŠNE ORIJENTACIJE BOSANSKOHERCEGOVAČKIH KOMPANIJA U PREHRAMBENOJ INDUSTRIJI

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M. Bičo Ćar

ABSTRACT:
The main goal of this paper is to analyze the impact of different determinants of market orientation of Bosnia and Herzegovina companies in the food processing industry. Three external (market turbulence, competitive intensity, technological turbulence) and three internal factors (top management emphasis, top management risk aversion, interdepartmental connectedness) areidentified. Having in mind the relevance of the presented empirical knowledge and results, and that the subject in question is unjustifiably neglected in the domestic scientific literature, the basic research question is: Is it possible to identify relevant determinants (external and internal factors) of the market orientation of Bosnia and Herzegovina companies ...

Keywords: *market orientation, food processing industry, determinants of market orientation*

SAŽETAK:
Glavni cilj ovog rada se odnosi na analizu uticaja različitih determinanti tržišne orijentacije bh. kompanija u prehrambenoj industriji. Za potrebe ovog istraživanja identificirana su 3 eksterna (dinamičnost tržišta, nivo konkurentnosti, stepen tehnoloških promjena) i 3 interna faktora (podrška top menadžmenta, sklonost top menadžmenta ka izbjegavanju rizika, međufunkcijska povezanost). Imajući u vidu relevantnost prezentiranih empirijskih saznanja i rezultata, te da je predmetna tema neopravdano zapostavljena u domaćoj naučnoj literaturi, osnovno istraživačko pitanje glasi: Da li je moguće identificirati relevantne determinante (eksterne i interne faktore) tržišne orijentacije bh. kompanija ...

Ključne riječi: *tržišna orijentacija, prehrambena industrija, determinante tržišne orjentacije*

MODIFIED GAUSS-TYPE COMPETITIVE SYSTEM

MODIFIKOVANIKOMPETITIVNI (KONKURENTSKI) SISTEM GAUSS-OVOG TIPA

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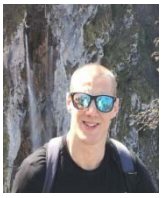
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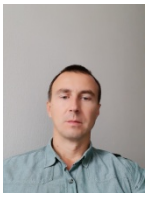
V. Hadžiabdić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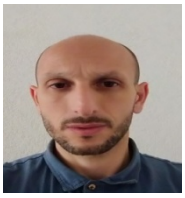
J. Bekteševič


D. Burgić

ABSTRACT:
In this paper, a generalized Gaussian competitive model is investigated. The local stability of the equilibrium points was examined, with special reference to the positive equilibrium points. They are of special importance, because from a biological point of view, it is an interesting case when both species survive.

Keywords: *equilibrium point, stability, trace, determinant.*

REZIME:
U ovom radu istražuje se generalizirani Gaussov kompetitivni (konkurentski) model. Ispitana je lokalna stabilnost točaka ekvilibrijuma,, s posebnim osvrtom na pozitivne točke ekvilibrijuma. Ove tačke ekvilibrijuma su od posebne važnosti, jer su sa biološkog aspekta zanimljive, posebno slučaj kada obje vrste prežive.

Ključne riječi*: tačkeekvilibrijum, stabilnost,trag, determinanta.*

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1. INTRODUCTION

Competitive systems of differential equations have wide application in practice. A special case of these models are predator prey models. Competition between two species with a limited number of individuals is observed here. Similar systems were observed in the papers [1], [2], [3], [4].

In the general case, there is no analytical way of solving nonlinear systems of differential equations, but with the knowledge of analytical solving of systems of linear differential equations, as well as the principle of linearization of a nonlinear system, qualitative information related to solving a nonlinear system.

NO EXISTENCE OF CHAOS IN THE SYSTEM OF RATIONAL DIFFERENCE EQUATIONS

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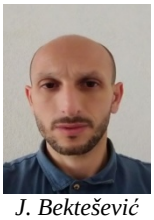
J. Bektešević


V. Hadžiabdić


M. Mehuljić


A. Mašić


A. Muminović

ABSTRACT:
In this paper we considered the existence of chaos in the system of rational differential equations of the first order with linear terms in the numerator and denominator, positive coefficients and non - negative initial conditions.We used Marott's definition and theorem for the existence of discrete chaos in the n dimensional case.It is shown that the point $O(0,0)$ cannot be a snap-back repeller for the corresponding map. Snap-back repeller is a special type of equilibrium point whose existence is necessary for the existence of chaos in the sense of Li-Yorke. It is shown that in the case of a systems of rational difference equations of the first order, with linear equations in the numerator and denominator with positive coefficients, the existence of a snap-back repeller is not possible.

Keywords: *chaos, stability, snap-back repeller, Marott's theorem, equilibrium.*

SAŽETAK:
U ovom radu razmatrano je prisustvo haosa u sistemu racionalnih diferentih jednačina prvog reda sa linearnim članovima u brojniku i nazivniku, pozitivnim koeficijentima i ne negativnim početnim uslovima. Korištena je Martonova definicija i teorema za postojanje haosa u n dimenzinalnom slučaju. Pokazano je da tačka O(0,0) ne može biti "snap-back repeller" (povratni repeler) za pridruženo preslikavanje. Povratni repeler je specijalni tip tačke ekvilibriuma čije postojanje je neophodno da bi postojao haos u Li-Yorke smislu. Pokazano je da u sistemu racionalnih diferentih jednačina prvog reda sa linearnim članovima u brojniku i nazivniku i pozitivnim koeficijentima postojanje povratnog repelera nije moguće.

Ključne riječi: *haos, stabilnost, "snap-back repeller" (povratni repeler), Marotonov teorem, ekvilibrijum*

THE MINIMUM COST FLOW PROBLEM (MCFP-CNF) INCLUDING VECHILES, TWO TYPES OF TIMES AND AMOUNT OF CARGO WITH MAXIMUM TIME

PROBLEM MINIMALNIH TROŠKOVA (MCFP-CNF) UKLJUČUJUĆI VOZILA, DVIJE VRSTE VREMENA I KOLIČINU TERETA SA MAKSIMALNIM VREMENOM

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O. Kurtanović


A. Kurtanović

ABSTRACT:
This paper extends the general problem of minimizing the total cost of transport on the road network (MCFP or CNF) by considering vehicles (one or more types) for the transport of uniform cargo, total transport time, maximum time and total amount of cargo with the longest time. Basically, there is one form of vehicle routing problem. We point to possible optimization by combining 5 criteria, 3 linear (LP) and 2 nonlinear (NP) ones over the same set of linear constraints. Interactive "analyst - software" algorithms were defined for cases of individual NP criteria, as well as multicriteria regardless of type. The hypothetical problem solving using Linear and Integer Programming software was illustrated.

Keywords: *cost flow problem, vehicle routing, total time, maximum time,* amount of cargo with maximum time*, multicriteria optimization, Pareto-solutions, algorithms, software*

SAŽETAK:
Ovim radom se opšti problem minimizacije ukupnih troškova transporta na mreži puteva (MCFP or CNF) proširuje razmatranjem vozila (jedne vrste ili više vrsta) za prevoz jednorodnog tereta, ukupog vremena transporta, maksimalnog vremena i ukupne količine tereta sa najdužim vremenom. U suštini, ima se jedan od oblika problema rutirannja vozila. Ukazujemo na moguću optimizaciju kombinovanjem 5 kriterija, 3 linearna (LP) i 2 neliearna (NP), nad istim skupom linearnih ograničennja. Definisani su interaktivni algoritmi „analitičar – softver“ za slučajeve pojedinačnih kriterija NP kao i više kriterija nezvisno od tipa. Ilustrira se rješavanje hipotetičkog problema primjenom softera za Linear and Integer Programming.

Ključne riječi: *problem protoka troškova, usmjeravanje vozila, ukupno vrijeme, maksimalno vrijeme, količina tereta s maksimalnim vremenom, multikriterijska optimizacija, Pareto-optimalna rješenja, algoritmi, softver*

ILLUSTRATIONS OF SELECTED MODELS AND OPTIMAL PROJECT PLANS

LUSTRACIJE ODABRANIH MODELA I OPTIMALNIH PLANOVA PROJEKTA

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Omer Kurtanović

ABSTRACT:
This paperfirst shown the solution of the model for minimizing project duration without limiting resources using manual procedures and MS Project software on the example of a hypothetical project with a small number of activities that are not allowed to interrupt, two categories of workers and two types of materials. Then, the formation of a mathematical model of mixed integer programming with one real variable and other binary variables for the model was illustrated when one category of workers on a project of minimum duration was minimized, provided that it is allowed to interrupt activities. This model was solved by applying software for linear and integer programming. The needs for other resources were further calculated. The same problem was solved by applying the MS Project software, where the identical optimal solution was determined.

Keywords: *project duration minimization, algorithm, software*

REZIME:
U ovm radu se prvo prikazuje rješavanje modela za minimizaciju trajanja projekta bez ograničavanja resursa primjenom ručnih postupaka i softvera MS Project na primjeru hipotetičkog projekta sa malim brojem aktivnosti kojima nije dozvoljeo prekidanje, dvije kategorije radnika i dvije vrste materijala. Zatim se ilustruje formiranje matematičkog modela mješovito celobrojnog programiranja sa jednom realnom promjenljivom i ostalim binarim promjenljivama za model kada se minimizira jedna kategorija radnika na projektu minimalnog trajanja uz uslov da je dozvoljeno prekidati aktivnosti. Ovaj model se rješava primjenom softvera za linearno i celobrojno programiranje. Dalje se proračunavaju potrebe za ostalim resursima. Isti problem se rješava i primjenom softvera MS Project, pri čemu se određuje identično optimalno rješenje.

Ključne riječi: *minimizacija trajanja projekta,algoritam, softver*

DRAMATIZATION AS A METHODICALPROCEDURE IN DEVELOPING ECOLOGICAL HABITS OF PRESCHOOL CHILDREN

DRAMATIZACIJA KAO METODSKI POSTUPAK URAZVIJANJU EKOLOŠKIH NAVIKA DECE PREDŠKOLSKOG UZRASTA

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ABSTRACT:
In order for children to develop ecological habits in a purposeful way, it is necessary to pay enough attention and provide interesting and meaningful activities, both in the family and in the educational context. We put children in different situations, encourage and motivate them to solve problems in different ways on their own and look for answers to important questions of the essence. In this way, we actually stimulate the development of critical thinking in children. This is exactly what enables children to form certain attitudes towards the eco-system, the way they treat living and non-living nature, towards themselves and other people. In this paper, the authors first pay attention to the theoretical elucidation of the problem, define the terms ecological awareness, eco - education, dramatization as a methodical procedure in the development of ecological habits, and then state the possibilities of its implementation in pedagogical practice. As a particularly suitable, they point out the play for children, which was realized according to the script of one of the authors of this work. They showed how the dramatization of a text with ecological content can contribute to the development of ecological habits of preschool children.
Key words: *environmental awareness, eco upbringing and education, text analysis, dramatization.*

SAŽETAK:
Da bi deca razvijala ekološke navike na svrsishodan način, neophodno je posvetiti dovoljno pažnje i obezbediti zanimljive i sadržajne aktivnosti, kako u porodičnom tako i u obrazovnom kontekstu. Decu stavljamo u različite situacije, podstičemo i motivišemo, da samostalno rešavaju probleme na različite načine i traže odgovore na bitna pitanja suštine. Na taj način zapravo stimulišemo razvoj kritičkog mišljenja kod dece.Upravo to omogućava da deca formiraju određene stavove prema eko-sistemu, načinu ophođenja prema živoj i neživoj prirodi, prema sebi i prema drugim ljudima.Autori u ovom radu najpre posvećuju pažnju teorijskom rasvetljavanju problema, bliže određuju pojmove ekološka svest, eko.obrazovanje, dramatizacija kao metodski postupak u razvijanju ekoloških navika, a potom navode i mogućnosti njene implementacije u pedagoškoj praksi. Kao posebno pogodnu ističu predstavuza decu koja je realizovana po scenariju jednog od autora ovog rada.Pokazaće kako dramatizacija jednog teksta ekološkog sadržaja može doprineti razvijanju ekoloških navika predškolske dece.
Ključne reči: *ekološka svest, eko vaspitanje i obrazovanje, analiza teksta, dramatizacija*

DIGITAL TRANSFORMATION OF AGRICULTURE: STATE IN THE GOVERNMENT SECTOR OF BOSNIA AND HERZEGOVINA

DIGITALIZACIJA POLJOPRIVREDE: STANJE U VLADINOM SEKTORU BOSNE I HERCEGOVINE

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G. Vico


D. Mijić


R. Bodiroga


S. Stupar

ABSTRACT:
Considering the importance of agriculture in Bosnia and Herzegovina (BiH), as well as benefits from digital transformation, digitalization of agriculture should be one of the key topic both in science and economy. This paper aimed to analyze status of digital agriculture in BiH through summarizing both strategic documentation and legislation as well as level of their implementation. Three key strategic document were analyzed, as well as relevant legislative at state and entity level. The research focused on information systems in government sector, including electronic registers, databases and evidences. Although BiH has a relative correct strategic framework for the digital transformation of agriculture in the public sector, as well as relevant legislative, it should be amended in the next planning period in accordance with EU aquis.

Keywords: *digitalization, agriculture, strategy, legislative, information systems, government, BiH*

REZIME:
S obzirom na značaj poljoprivrede u Bosni i Hercegovini (BiH), kao i na koristi digitalne transformacije, digitalna poljoprivreda bi trebala biti jedna od ključnih tema, kako u nauci, tako i u privredi. Cilj rada je analiza digitalne poljoprivrede kroz sumiranje strateških akata i legislative, te nivoa njihove implementacije. Analizirana su tri ključna strateška dokumenta iz sektora, te relevantna zakonska legslativa na državnom i entitetskim nivoima. Istraživanje je fokusirano na informacione sisteme, uključujući registre, baze podataka i evidencije. Iako postoji relativno dobar strateški okvir za digitalnu transformaciju poljoprivrede u javnom sektoru, što važi i za zakonsku legislativu, isti bi trebali kroz izmjene i dopune trebali biti unapređeni u skladu sa EU aquis-om.

Ključne reči: *Digitalizacija, strategija, legislativa, informacioni sistemi, vlada, BiH*

Autors Index – Indeks autora

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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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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

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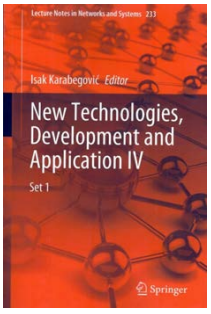

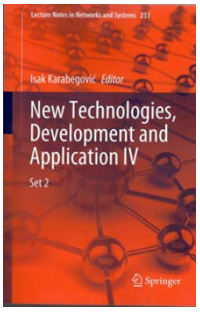

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