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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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DRUŠTVO ZA ROBOTIKU U BOSNI I HERCEGOVINI
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”NT-2024“

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NOVE TEHNOLOGIJE - RAZVOJ I PRIMJENA

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SOCIETY FOR ROBOTICS OF B&H - Društvo za robotiku u Bosni i Hercegovini
St. Petog korpusa br.3
77000 BIHAĆ, BOSNIA and HERZEGOVINA
E-mail:ic.newtech@gmail.com
www.icnt.ba

Technical editors - Tehnički urednici:
Prof. Isak Karabegović, PhD
Prof. Mehmed Mahmić, PhD
Prof. Ermin Husak, PhD

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TEHNOLOŠKI PARK “INTERA” U MOSTARU

NEW TECHNOLOGIES - DEVELOPMENT AND APPLICATION „NT-2024“

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, 15th May 2024 *THE ORGANIZERS*

NOVE TEHNOLOGIJE - RAZVOJ I PRIMJENA „NT-2024“

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, 15. maja, 2024. godina *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, 15th May 2024 *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, 15. maj, 2024. godina *ORGANIZATORI*

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„NEW TECHNOLOGIES, DEVELOPMENT AND APPLICATION“

„NOVE TEHNOLOGIJE, RAZVOJ I PRIMJENA“

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ACADEMY OF SCIENCES AND ARTS
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Prof. M. Venkatashamy Reddy
Senior Professional Researcher
Energy Storage Technology at Nouveau Monde Graphite
Quebec, Montreal
Canada

Topic: "ADVANCES IN MATERIALS FOR ENERGY STORAGE AND ITS SUSTAINABILITY LESSONS"

Biography:

Dr. M. V. Reddy obtained his PhD (2003) in the area of Materials Science and Engineering (with highest distinction) from the University of Bordeaux, France. From July 2003 to May 2019, he worked at the Department of Materials Science and Engineering, Chemistry and Physics, National University of Singapore (NUS), Singapore. June 2019 to Aug 2021, he had worked at the Centre of Excellence in Transportation Electrification and Energy Storage, Hydro-Québec, Canada. Currently working as a Senior Professional Researcher and group leader in Energy Storage Technology at Nouveau Monde Graphite (New graphite world (NMG)), Quebec, Montreal, Canada. Dr. Reddy has published 220 papers in various international journals and Land review paper published in Chemical Reviews, cited over 2870 times. Dr. Reddy is serving as an editorial advisory board member in Materials Research Bulletin and Journal of Energy Storage (Elsevier, Scopus journal), Journal of Solid State Electrochemistry (Springer) as well as several open access journals. Invited life member in ICDD USA and IPS Singapore and Global Materials Network. Invited committee member in various international Research proposals, PhD theses examiner and conference organizations and visiting Professor at various Universities.

Prof. Bernhard Mitschang
University of Stuttgart
Institute of Parallel and Distributed Systems
Stuttgart, Germany

Topic: "A REVIEW OF DATA SCIENCE APPROACHES TO QUALITY CONTROL IN MANUFACTURING"

Biography:

Bernhard Mitschang is professor for Database and Information Systems and head of the department 'Applications of Parallel and Distributed Systems' that is part of the Institute of Parallel and Distributed Systems at the Universität Stuttgart, Germany. Both research and teaching spectra of his department cover on one hand data-intensive applications ranging from business applications to engineering systems and on the other hand fundamental data management techniques, data analytics as well as scalable data processing architectures.

Since 2013, he is CEO of the Graduate School of Excellence on advanced Manufacturing Engineering and head of the Technology Partnership Lab at the university.

Prof. Sathiskumar Anusuya Ponnusami

City, University of London
Department of Engineering
London, UK

Topic: "POTENTIAL OF GENERATIVE AI IN ENGINEERING: FROM MATERIALS DESIGN TO ROTOR PROFILE OPTIMISATION"

Biography:

Dr Sathiskumar Anusuya Ponnusami is a Senior Lecturer (Associate Professor) in Structural Mechanics within the Department of Engineering at City, University of London. His research interests encompass computational modelling and design of materials and structures while his ongoing research exploits utilising machine learning tools for mechanics and materials engineering problems. He is the recipient of the UK-Italy Trustworthy AI Researcher Award from the Alan Turing Institute, the National Institute for Data Science and AI in the UK. He also served as the Data Study Group (DSG) PI at the Alan Turing Institute to deploy machine learning algorithms for mechanics problems. Prior to his current position, he worked as a postdoctoral researcher in the Solid Mechanics Group at the University of Oxford, UK, on developing computational damage models and data-driven machine learning (ML) tools for fan blades within the Rolls-Royce University Technology Centre.

During his career, he was awarded several prizes including the Airbus-UNESCO Fly Your Ideas winner 2015 for innovation in aerospace, NLF Dutch Aerospace Award for the best aerospace engineering student in the Netherlands 2015 and the Young Scientist Award at the International Conference on Self-Healing Materials, Ghent Belgium 2013(£5,000). He was recently awarded a Newton International Fellowship Grant from the Royal Society, as the UK applicant to develop AI tools for active vibration control. He also holds an UKRI-EPSRC grant as the PI to develop hybrid AI-driven simulation tools for failure predictions. His ongoing research also includes developing health monitoring strategies using deep learning (supported by IMechE's Astridge Scholarship) and AI-driven design tools for compressor blade design (funded by Industrial Consortium, CERES). His research outputs include 40 journal articles, 30 international conference presentations, 7 book chapters and a patent.

Prof. Igor Drstvenšek
University of Maribor
Faculty of Mechanical Engineering
Maribor, Slovenia

Topic: "ADDITIVE MANUFACTURING AND METALS IN BIOMEDICAL APPLICATIONS"

Biography:

Prof. Dr. Igor Drstvensek began his career at the Slovenian company Libela Celje, where he introduced CAD/CAM into everyday working life in the early 1990s. After completing his Masters degree at the University of Maribor, he worked as a visiting scientist at the University of Erlangen and the Vienna University of Technology. After completing his doctorate, he began his academic career at the Faculty of Mechanical Engineering at the University of Maribor, where he works as a lecturer in production technologies and maintenance. He is a guest lecturer at the University of Applied Sciences Technikum Wien (Austria), at MCI Innsbruck (Austria) and at the Technical University of Cluj-Napoca (Romania), where he was appointed honorary professor in 2008. His research work over the last 15 years has been dedicated to additive manufacturing and in particular to medical applications of additive manufacturing.

He is the head of the additive manufacturing laboratory at the Faculty of Mechanical Engineering at the University of Maribor. In 2006, he initiated the first implant production using additive manufacturing technologies in Slovenia, and in the last 17 years he has carried out 60 projects for the production of cranial and maxillofacial implants. From 2016 to 2019, he carried out the development and clinical trial of a patient-specific revision acetabular cup manufactured using selective laser melting technology. He is the author of 6 national patents and 5 international patent applications. In September 2017, he was honoured with the Fujian Honorary Citizenship, which is given in recognition of outstanding contributions to the economic and social development of Fujian Province (China). His research work has been published in 545 bibliographic units, including 69 scientific papers, 24 technical papers, 154 conference papers and 9 books. In the past 10 years, his work has been cited 933 times.

Prof. Edouard Ivanjko
University of Zagreb
Faculty of Transport and Traffic Sciences
Department of Intelligent Transportation Systems
Zagreb, Croatia

Topic: "ARTIFICIAL INTELLIGENCE BASED URBAN TRAFFIC CONTROL"

Biography:

Edouard Ivanjko is a Professor at the Department of Intelligent Transportation Systems at the University of Zagreb, Faculty of Transport and Traffic Sciences. His research interests are related to Intelligent Transportation Systems, modeling, and simulation of road traffic, road traffic control systems based on machine learning, forecast of road traffic parameters, autonomous vehicles, and the application of computer vision in road traffic. He participated as a senior researcher on various national and international projects like IPA project Computer Vision Innovations for Safe Traffic (VISTA), FP7 project Intelligent Cooperative Sensing for improved traffic Efficiency (ICSI), the national scientific project Development Methodology of Integrated Adaptive Transport-logistic Systems, COST action TU1102 Towards Autonomic Road Transport Support Systems (ARTS), COST action IC1406 High-Performance Modelling and Simulation for Big Data Applications (cHiPSet), Advanced methods and technologies in Data Science and Cooperative Systems (DATACROSS), and EU structural fund projects System for route optimization in a dynamic transport environment (SORDITO)and Skipping Boundaries with Internationalization (LoMI). Currently, he is a member of the Croatian Centre of Research Excellence for Data Science and Advanced Cooperative Systems.He also participates in the project Software Sensor Augmentation at Environmental Data Analysis Laboratory (SSA@EDAL) and leads the project Development of Learning Agent-based Systems for Improved Urban Traffic Control (DLASIUT) both financed by the Croatian Science Foundation (HRZZ). Additionally, he is also working as a consultant in evaluating research and development innovation projects financed by Croatia’s national and EU structural fund programs. He is a member of ITS Croatia, IEEE, Croatian Academy of Engineering,and KOREMA.

CONTENTS – SADRŽAJ

SEMI-SYNCHRONOUS MOVEMENTS OF TWO COLLABORATIVE UR10E ROBOTS CONTROLLED BY MATLAB VIA TCP/IP PROTOCOL

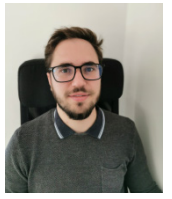
Timi Karner[1], Luka Krapež[1], Matic Petauer[1], Janez Gotlih[1], Rok Belšak[1]
[1]University of Maribor, Faculty of Mechanical Engineering, Laboratory for Robotisation, Slovenia


Timi Karner


Luka Krapež


Matic Petauer


Janez Gotlih


Rok Belšak

ABSTRACT:
Collaborative robots are mainly used in the applications where human-robot cooperation is required. In some applications heavier objects should be manipulated for the worker to assembly the required piece. Matlab program and TCP/IP protocol was used to establish a successful communication and to develop a control algorithm to perform semi-synchronous movements with two collaborative UR10e robots. Main application was to manipulate an object with both robots simultaneously. Matlab main task was to calculate new position and orientation for the object manipulation and send it to both robots. Matlab program was also responsible for synchronization of both robots. A successful demonstration was presented for translational and rotational manipulation of the object around its own coordinate system while both collaborative robots grab, manipulate and release the object.

Keywords: *semi-synchronous movements, collaborative robots, Matlab, TCP/IP protocol*

1. INTRODUCTION

Industrial robots have revolutionized manufacturing processes across various industries, offering unmatched precision, repeatability, and productivity gains. As technology advances, the demand for even higher levels of precision and efficiency in manufacturing continues to grow. In this context, the integration of synchronous motions into collaborative industrial robot operations has emerged as a promising avenue for achieving enhanced performance and versatility.

Classical industrial robot manufacturers offer additional add-ins for synchronous movements of two or more industrial robots. For example,ABB company offers MultiMove option[1].This option let one controller to handle several robots which allows advanced coordination between different robots in the application. It is possible to use this option for different applications such as several robots can work on the same moving work object, one robot can move an object, while the other robot works on it and last but not least, several robots can cooperate to lift heavy objects. This option allows independent movement, semi coordinated movements and coordinated synchronized movements of the industrial robots.

FROM INDUSTRIAL ROBOTS TO COLLABORATIVE ROBOTS: EXPLORING THE TRANSFORMATION IN THE COLLABORATIVE WORK ENVIRONMENT

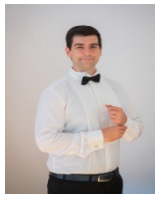
Vasile Gusan[1], Aurel Mihail Țîțu[2,3], Adrian Bogorin-Predescu[4], Petrică Tertereanu[5], Daniel Bâlc[6], Alina Bianca Pop[7]
[1,4,5,6]National University of Science and Technology POLITEHNICA Bucharest, Faculty of Industrial Engineering and Robotics, Bucharest, Romania
[2]Lucian Blaga University of Sibiu, Sibiu, Romania
[3]The Academy of Romanian Scientists, Bucharest, Romania
[7]Technical University of Cluj-Napoca, North University Center of Baia Mare, Romania


Vasile Gusan


Aurel Mihail Țîțu


Adrian Bogorin-Predescu


Petrică Tertereanu


Daniel Bâlc


Alina Bianca Pop

ABSTRACT:
Collaborative robots play a crucial role in reshaping the automotive industry, significantly contributing to optimizing process efficiency and effectiveness. With the implementation of the new ISO 10218 standard in 2024, speculations arise about a significant shift in conceptualizing the term "collaborative robot." This theoretical change may emphasize the idea that, in reality, there are no collaborative robots but rather collaborative applications. This scientific work conducts a detailed investigation of these hypotheses, aiming to identify potential transformations that can morph industrial robots into collaborative entities. The authors strive to pinpoint ways in which a production flow, whether involving collaborative or industrial robot technology, can evolve into a truly collaborative working environment, making substantial contributions to progress and innovation in the automotive industry.

Keywords: *collaborative robot, automation, industrial robot, automotive, safety environment*

1. INTRODUCTION

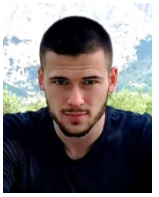
Collaborative robots have become an efficient solution for optimizing mass production processes, experiencing increased usage across various industrial sectors, including the automotive industry. While designed to collaborate with human operators, these robots have been successfully integrated into different stages of the production chain, operating at high speeds or handling dangerous tools. [1] Their capacity to collaborate harmoniously with human counterparts opens new frontiers in automation, redefining the dynamics of collaborative work environments. [2] To confirm the viability of a collaborative environment, the implementation of collaborative robots within a collaborative application is a crucial aspect.

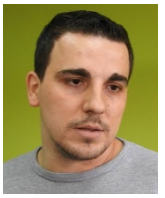
USING ARTIFICIAL INTELLIGENCE IMAGE GENERATORS IN PRODUCT DESIGN WITHIN INDUSTRY 4.0

UPOTREBA AI GENERATORA SLIKE U DIZAJNU PROIZVODA UNUTAR INDUSTRIJE 4.0

Samir Lemeš, Muharem Keleštura, Edin Tabak, Nevzudin Buzađija
University of Zenica, Fakultetska 1, 72000 Zenica, Bosnia and Herzegovina


Samir Lemeš


Muharem Keleštura


Edin Tabak


Nevzudin Buzađija

ABSTRACT:
We are witnessing a sudden increase in the general public's interest in computer graphics, whose creation is due to AI image generators. These tools are responsible for creating realistic graphics from the entered text description. They are based on deep learning algorithms trained on an extensive graphical data set. Recently, the artificial intelligence system behind OpenAI, DALL-E 2, which can generate digital images based on textual descriptions, has become widely available. In addition, more and more similar tools are appearing on the market, such as Craiyon, Imagen, Midjourney, Stable Diffusion, etc. AI-generated design is an emerging technology whose advantages and disadvantages in engineering applications have yet to be verified. We analysed the advantages and disadvantages of applying this technology in product design within Industry 4.0.

Keywords:*Artificial Intelligence, AI image generator, Computer Graphics, CAD*

REZIME:
Svjedoci smo naglog porasta interesovanja šire javnosti za računarsku grafiku, za čije stvaranje su zaslužni AI generatori slika. Ovi alati odgovorni su za kreiranje realistične grafike iz unesenog tekstualnog opisa. Zasnovani su na algoritmima dubokog učenja obučenim na opsežnom skupu grafičkih podataka. Nedavno je postao široko dostupan sistem vještačke inteligencije koji stoji iza OpenAI, DALL-E 2, koji može da generiše digitalne slike na osnovu tekstualnih opisa. Osim toga, na tržištu se pojavljuje sve više sličnih alata, kao što su Craiyon, Imagen, Midjourney, Stable Diffusion, itd. Dizajn generiran vještačkom inteligencijom je tehnologija u nastajanju čije prednosti i nedostaci u inženjerskim aplikacijama tek treba provjeriti. Analizirali smo prednosti i nedostatke primjene ove tehnologije u dizajnu proizvoda u okviru Industrije 4.0.

Ključne riječi: *Vještačka inteligencija, AI generator slike, računarska grafika, CAD*

DEVELOPING 3D WELDING PROCESS WITH SIEMENS NX AND KUKA ROBOT MANIPULATOR

Rok Belšak[1], Robert Plevčak[1], Janez Gotlih[1], Tomaž Vuherer, Mirko Ficko[1], Timi Karner[1]
[1]University of Maribor, Faculty of Mechanical Engineering,
Laboratory for Robotisation, Slovenia


Rok Belšak

Robert Plevčak

Janez Gotlih

Tomaž Vuherer

Mirko Ficko

Timi Karner

ABSTRACT:
Additive manufacturing (AM) has brought significant changes to the manufacturing industry. Among various AM methods, Wire Arc Additive Manufacturing (WAAM) is known for its cost-effectiveness and speed in creating metal structures. This paper discusses the development and initial testing of WAAM on a robotic system using Siemens NX. The system converts a CAD model into G-code and translates it to KUKA Robotic Language (KRL). This results in a complex welding trajectory useful for high quality prototype products or additional welding on semi-finished products.

Keywords: *Robot welding, WAAM, SIMENS NX, 3D welding, MIG/MAG*

1. INTRODUCTION

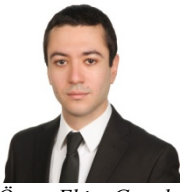
The manufacturing realm has witnessed an evolutionary shift with the advent of additive manufacturing (AM) technologies, which have emerged as a compelling alternative to traditional manufacturing methodologies. In the industry, additive manufacturing technology, mainly 3D printing, is frequently used for prototype creation due to its affordability. 3D printers, primarily dealing with polymer materials, offer cheap and quick printing of desired products. However, they fall short of applications with higher load requirements. This brings metal applications in widespread use, like printers employing laser sintering of metal, capable of precisely and quickly manufacturing smaller final products. But for larger and more complex products, welding is gaining emphasis. By combining additive technology and material removal technology, cheaper and faster production can be achieved.
Among the various AM techniques, Wire Arc Additive Manufacturing (WAAM) has garnered significant attention owing to its potential, which lies in its ability to combine the benefits of welding and additive manufacturing.

COMPARISON OF TWO CONTROL STRATEGIES FOR A QUARTER DRONE SYSTEM

Rosario La Regina[1], Maria Curcio[1], Ömer Ekim Genel[2], Carmine Maria Pappalardo[1]
[1]University of Salerno, Fisciano, Italy
[2]Istanbul Technical University, Istanbul, Türkiye


Rosario La Regina


Maria Curcio


Ömer Ekim Genel


Carmine Maria Pappalardo

ABSTRACT:
The paper aims to present a comparison of the two different control strategies, PD and LQR, using the virtual prototype of an experimental platform called quarter droneby the authors. The model analyzed is composed of the arm of a drone that is free to rotate only around one of its axes. To maintain the prototype in a stable configuration, two types of controllers are compared for the present model, namely PD and LQR controllers. Subsequently, the better performing control system is used for trajectory tracking.The realization of the virtual prototype isperformed through the use of SOLIDWORKS software, while the dynamic analysis of the system and the development of the control law are carried out in the SIMULINK environment, using the SIMSCAPE MULTIBODY toolbox. Finally, by using a simple theoretical model, the thrust is modeled, and the number of revolutions is calculated to verify the accuracy of the obtained results.

Keywords: *drone, nonlinear control, UAV, PID, LQR, SIMSCAPE MULTIBODY, SIMULINK, SOLIDWORKS*

1. BACKGROUND INFORMATION

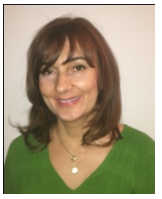
In this section, a brief analysis of the state of the art regarding drones and control systems is provided for the benefit of the reader. The term “drones”refers to a class of vehicles that includes unmanned aerial vehicles (UAVs) and micro aerial vehicles(MAVs) [1]. These systems can be either autonomous guided or remotely human-guided. The first category is characterized by quite high mission completion reliability, as the guidance is not human but is provided by a controller that, through a series of sensors, can identify the surrounding field and move in an also-variable environment, assuming the characteristics of both deterministic and nondeterministic system [2-3]. The application scope of such systems is very various; both civil and military missions are covered. In the civil sector, for example, they are used for industrial storage management, surveillance, environmental protection, weather monitoring, planning, and urban management [4].

DEVIATION ANALYSIS OF UPPER LEG ANGLE MEASUREMENTS: INSIGHTS INTO INERTIAL SENSOR PLACEMENT STRATEGIES

ANALIZA ODSTUPANJA MJERENJA UGLOVA NATKOLJENICE: UVID U STRATEGIJE POZICIONIRANJA INERCIJALNIH SENZORA

Mustafa Bevrnja[1], Adisa Vučina[2], Hadis Bajrić[3]
[1]Faculty of Mechanical Engineering, University of Sarajevo
[2]Faculty of Mechanical Engineering, Computing and Electrical Engineering,University of Mostar
[3]Faculty of Mechanical Engineering, University of Sarajevo


Mustafa Bevrnja


AdisaVučina


Hadis Bajrić

ABSTRACT:
In order to preserve the health of workers, extensive ergonomic analyzes of the load on the human body are carried out, but in order to obtain concrete results and the possibility of better optimization of the work task, it is necessary to have reliable data that represent actual measured values. This paper provides an insight into the deviations of upper leg angle measurements depending on the placement position of the inertial sensors and gives advice on how to minimize measurement deviations. The sensors collect data on Euler angles, Yaw, Pitch and Roll, which are later converted into values of extension and flexion, adduction and abduction as well as external and internal rotation in the hip. As the sensors are attached to the upper leg, muscle contractions deform the surface on which the sensors are positioned, which leads to deviations in the reading of the angle of the upper leg. In an ideal case, the actual angles would be obtained by spatial analysis of the position of the femoral head and femoral condyle in the pelvic reference system. Also, the possibility of a non-standard way of attaching the sensor to the examinee's leg was examined and compared with previously obtained results.
Keywords: *motion tracking, inertial sensors, biomechanis, leg kinematics, deviation*

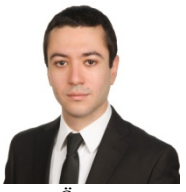
REZIME:
U cilju očuvanja zdravlja radnika provode se opsežne ergonomske analize opterećenja ljudskog tijela, ali da bi se dobili konkretni rezultati i mogućnost što bolje optimizacije radnog zadatka, potrebno je imati pouzdane podatke koji predstavljaju stvarne izmjerene vrijednosti. Ovaj rad daje uvid u odstupanja mjerenja ugla natkoljenice u zavisnosti od položaja postavljanja inercijalnih senzora i daje savjete kako minimizirati odstupanja mjerenja. Senzori prikupljaju podatke o Eulerovim uglovima, Yaw (ugao skretanja), Pitch (ugao nagib) and Roll (ugao prevrtanja), koji se kasnije pretvaraju u vrijednosti ekstenzije i fleksije, adukcije i abdukcije kao i vanjske i unutrašnje rotacije u kuku. Kako su senzori pričvršćeni za natkoljenicu, mišićne kontrakcije deformiraju površinu na kojoj su senzori postavljeni, što dovodi do odstupanja u očitavanju ugla natkoljenice. U idealnom slučaju, stvarni uglovi bi se dobili prostornom analizom položaja glave femura i kondila femura u referentnom sistemu karlice. Takođe, ispitana je mogućnost nestandardnog načina pričvršćivanja senzora na nogu ispitanika i upoređena sa prethodno dobijenim rezultatima.
Ključne riječi:*praćenje pokreta, inercijalni senzori, biomehanika, kinematika nogu, devijacija*

A DYNAMIC STUDY ON THE KEY ASPECTS OF A HELICOPTER MAIN TRANSMISSION SYSTEM

Rosario La Regina[1], Maria Curcio[1], Ömer Ekim Genel[2], Carmine Maria Pappalardo[1]
[1]University of Salerno, Fisciano, Italy
[2]Istanbul Technical University, Istanbul, Türkiye


Rosario La Regina


Maria Curcio


Ömer Ekim Genel


Carmine Maria Pappalardo

ABSTRACT:
The following paper aims topresent the fundamental aspects of the helicopter main transmission and its further dynamic analysis. The first part of the paper can be seen as a preliminary description of the world of helicopters, with a focus on the main transmission. Thus, the components that characterize it and the different controls to perform flight maneuvers are described. The main transmission described in the paper is a virtual prototype designed in the SOLIDWORKS environment. Having finished this purely descriptive analysis, the focus is placed on the heart of the work, namely, the dynamic analysis. To this end, the transmission modeling is carried out in a multibody environment, more specifically through MATLAB/SIMULINK. The evaluation of the force field exerted to the mechanism is carried out using the aerodynamic coefficients CL and CD, whose values are derived through XFOIL aerodynamic simulation software.

Keywords: *helicopter, main transmission, XFOIL, multibody, MATLAB, SIMSCAPE MULTIBODY*

1. INTRODUCTION

The basic design concept of modern helicopters originated from Igor Ivanovich Sikorsky. According to this design concept, the helicopter is equipped with a single main rotor, tail rotor, and fuselage. The version of Sikorsky is named in the literature as the classical helicopter and consists of only one propulsion system which is the principal rotor. Because of its rotation, it generates a reaction torque of gyroscopic nature, hence a second rotor, called the tail rotor, which is also called the anti-torque rotor, is installed [1-3].This architecture is the most widely used and is the subject of this research work, with particular emphasis on the main rotor. This basic concept has been developed over the years leading to more sophisticated technology capable of taking into account various aspects related to both construction issues and ...

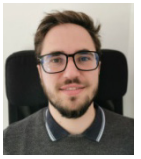
EFFICIENT 3D ALIGNMENT OF PHYSICAL STRUCTURES WITH CAD MODEL NOMINALS IN MANUFACTURING: A GENETIC ALGORITHM APPROACH

Gotlih Janez[1], Marko Pišek[1], Karner Timi[1], Belšak Rok[1], Brezočnik Miran[1]
[1]University of Maribor, Faculty of Mechanical Engineering, Maribor, Slovenia
[2]SMM production systems, Ltd., Maribor, Slovenia


Janez Gotlih


Marko Pišek


Timi Karner


Rok Belšak


Miran Brezočnik

ABSTRACT:
In modern industry, the accurate alignment of components and machines in three-dimensional space is a major challenge, especially in fields such as automotive and aerospace. This work addresses the critical issue of aligning physical structures with their corresponding CAD models, a crucial step in ensuring accurate assembly and manufacturing processes. A novel alignment method is presented using genetic algorithms to optimize the six degrees of freedom of the measured coordinate system. This optimization minimizes the need for subsequent manual adjustments, increasing efficiency and accuracy. The method is applied to a practical case involving the assembly of sheet metal parts for truck cabins, using FARO tracker technology for measurements and MATLAB for analysis. The results of applying the genetic algorithm show a remarkable reduction in the number of fixture support elements to be adjusted from 16 to only 1, highlighting the effectiveness of this approach in streamlining the alignment process and improving overall manufacturing productivity.

Keywords: *fixture assembly, measurement alignment, laser tracker, optimization algorithm*

1. INTORDUCTION

It is difficult to determine the exact position and orientation of bodies in 3D space, especially when large bodies are involved[1]. An example of this are the automotive and aerospace industries, where it is necessary to ensure the required position and orientation of individual components when assembling or machining large parts to ensure that the product is manufacturable and meets the required standards. Correct positioning of assembly components or workpieces during machining is achieved by designing a precise fixture to clamp the machined parts. Fixture design and assembly must ensure that support elementsare properly positioned to align all components for the subsequent process. In many cases, the fixtures are not actuated, and the positionsof the support elements are fixed. When assembling such a fixture, measurement and adjustment can be used to ensure that the position and ...

INVESTIGATION OF CONDITIONS OF DIRECTED THERMAL INFLUENCE ON CHANGES OF PHYSICAL AND MECHANICAL PROPERTIES OF DIAMOND GRAINS IN A GRINDING WHEELS

ISTRAŽIVANJE USLOVA DIREKTNOG TERMIČKOG UTICAJA NA PROMENE FIZIČKIH I MEHANIČKIH SVOJSTVA DIJAMANTSKIH ZRNA I NJIHOVE OTPORNOSTI NA TROŠENJE U BRUSNIM TOČKOVIMA

Valerii Lavrinenko[1], Halyna Ilnytska[1], Volodymyr Smokvyna[1], Predrag Dašić[2], Vladimir Fedorovich[3]
[1]V. Bakul Institute for Superhard Materials, the NAS of Ukraine, Kyiv, Ukraine
[2]Engineering Academy of Serbia (IAS), Belgrade, Serbia
[3]SaTCIP Publisher Ltd., Vrnjačka Banja, Serbia
[4]National Technical University Kharkiv Polytechnic Institute, Kharkiv, Ukraine


Valerii Lavrinenko


Halyna Ilnytska


Volodymyr Smokvyna


Predrag Dašić


Vladimir Fedorovich

ABSTRACT:
The article presents information on the features and physical and mechanical characteristics of diamonds synthesized in Ni–Mn–C and Fe–Si–C systems, their impurity composition. It is proved that in the Fe–Si–C and Ni–Mn–C systems different contents of inclusions and impurities in diamonds are formed, and therefore different ranges of the value of specific magnetic susceptibility, moreover, diamonds of the Ni–Mn–C system have a range of up to 100·10^{-8} m^3/kg, but for diamonds of the Fe–Si–C system it is larger – from 100 to 1200·10^{-8} m^3/kg, and, therefore, potentially have much greater opportunities in the directional change their properties. Using scanning electron microscopy, an elemental analysis of the faces of diamond crystal faces synthesized in both systems was performed after their heat treatment, ...
Keywords: *grinding, grinding tool, diamonds, specific magnetic susceptibility, high-temperature heating, strength.*

REZIME:
U članku su date informacije o svojstvima i fizičko-mehaničkim karakteristikama dijamanata sintetizovanih u sistemima Ni–Mn–C i Fe–Si–C, njihovom nečistoćem sastavu. Dokazano je da se u sistemima Fe–Si–C i Ni–Mn–C formiraju različiti sadržaji inkluzija i nečistoća u dijamantima, a samim tim i različiti rasponi vrijednosti specifične magnetske susceptibilnosti, štaviše, dijamanti Ni–Mn– 10–8 m3/kg, te stoga potencijalno imaju·10–8 m3/kg, ali za dijamante Fe–Si–C sistema je veći – od 100 do 1200·C sistem imaju raspon do 100 mnogo veće mogućnosti u pravcu promene svojih svojstava. Pomoću skenirajuće elektronske mikroskopije izvršena je elementarna analiza lica dijamantskih kristalnih površina sintetizovanih u oba sistema nakon njihove termičke obrade, ...
Ključne riječi: *brušenje, alat za brušenje, dijamanti, specifična magnetska osjetljivost, visokotemperaturno zagrijavanje, čvrstoća.*

A CONTRIBUTION TO THEORETICAL-EXPERIMENTAL RESEARCH OF TRANSVERSE VIBRATIONS OF THE AXLE SPINDLE LEVER OF A COMMERCIAL MOTOR VEHICLE

PRILOG TEORIJSKO-EKSPERIMENTALNOM ISTRAŽIVANJU POPREČNIH VIBRACIJA POLUGE RUKAVCA TERETNOG MOTORNOG VOZILA

Miroslav Demić
Faculty of Engineering Sciences, Kragujevac, Serbia

Miroslav Demić

ABSTRACT:
Vibrations that occur during the operation of commercial motor vehicles lead to fatigue of the users and materials of the aggregates. Therefore, in this paper, an attempt was made to develop a method for their identification. The method is illustrated in the example of the axle spindle lever, and for the twovariable frequency analysis, the 2D Fourier transform was used. The illustration of the procedure's applicability was performed on its idealized model, and the conducted research showed that the two-parameter frequency analysis can also be used in generating transverse vibrations in laboratory conditions.

Keywords: *Commercial motor vehicle, axle spindle lever, transverse vibrations, two-parameter frequency analysis*

REZIME:
Vibracije koje se javljaju tokom eksploatacije teretnih motornih vozila dovode do pojave zamora korisnika i materijala agregata, pa je, u ovom radu učinjen pokušaj razvoja metode za njihovu identifikaciju . Metoda je ilustrovana na primeru poluge rukavca, a za dvo-parametarsku frekventnu analizu je korišćena 2D Furijeova transformacija. Ilustracija mogućnosti primene postupka je izvršena na njenom idealizovanom modelu, a izvršena istraživanja su pokazala da se dvo-parametarska frekventna analiza može koristiti i pri generisanju poprečnih vibracija u laboratorijskim uslovima.

Ključne reči: *Teretno motorno vozilo, poluga rukavca, poprečne vibracije, dvo-parametarska frekventna analiza*

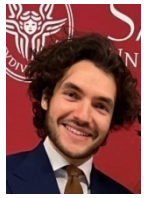
DYNAMICAL BEHAVIOR OF THE GLYCOLYSIS MODEL INVOLVING THE FRACTIONAL CAPUTO DERIVATIVE

Fatiha Mesdoui [1], Naziha Belmahi[2], Raffaele Romano[3], Piercarlo Cattani[4], Francesco Villecco[5]
[1]Department of Mathematics, Mohamed Seddik Ben Yahia University, Jijel, Algeria
[2]Department of Mathematics, University of Sciences and Technology Mohammed Boudiaf, Oran, Algeria
[3]Department of Agricultural Science, University of Naples "Federico II", Naples, Italy
[4]Department of Computer, Control and Management Engineering, University of Rome “La Sapienza”, Roma, Italy
[5]Department of Industrial Engineering, University of Salerno, Fisciano, Italy


Naziha Fatiha


Belmahi Mesdoui


Raffaele Romano


Piercarlo Cattani


Francesco Villecco

ABSTRACT:
This paper introduces a comprehensive model for studying the glycolysis pathway, involving the fractional Caputo derivative to delve into its dynamics. By employing the fractional Caputo derivative, the study explores the system's behavior and reveals insights into its stability and bifurcation points. Numerical simulations are conducted to demonstrate how the fractional-order derivative influences the system's behavior.

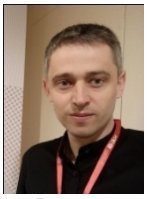
Keywords: *: Stability, Hopf bifurcation; fractional derivative,glycolysis.*

1. INTRODUCTION

The general model of glycolysis stands as a cornerstone in understanding cellular energymetabolism, delineating the conversion of glucose to pyruvate while yielding crucialATP and NADH. This metabolic pathway, fundamental across organisms, extends itssignificance beyond energy production, it converts a typeof sugar (the glucose: $C_6H_{12}O_6$) into ATP, described by thefollowing overall equation [1-3].

RELATED PERFORMANCE OF SURFACE MICRORELIEF EVALUATION IN ULTRASONICALLY AND SHOT PEENED INCONEL 718 ALLOY MANUFACTURED BY LASER POWDER BED FUSION PROCESS

Dmytro Lesyk[1], Silvia Martinez[2], Bohdan Mordyuk[3], Daniel Grochala[4], Aitzol Lamikiz[5]
[1,2.5]Aeronautics Advanced Manufacturing Center, University of the Basque Country, Zamudio, Spain
[1]Laser Systems and Advanced Technologies Department, National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Kyiv, Ukraine
[1,3]Principles for Surface Engineering Department, G.V. Kurdyumov Institute for Metal Physics of the NAS of Ukraine, Kyiv, Ukraine
[4]Mechanical Engineering Department, West Pomeranian University of Technology, Szczecin, Poland
[5]Mechanical Engineering Department, University of the Basque Country, Bilbao, Spain


Dmytro Lesyk


Bohdan Mordyuk


Daniel Grochala


Aitzol Lamikiz

ABSTRACT:
In this study, the effects of the ultrasonic shot peening, multi-pin ultrasonic impact peening, and shot peening on the 3D surface texture parameters and functionality-related properties of additively manufactured Inconel 718 material were analyzed and compared. Inconel 718 alloy parts were produced by a laser powder bed fusion (LPBF) additive manufacturing process with a build angle of 90° using a stripe scanning strategy. The influence of severe surface plastic deformation techniques on surface morphology evolution and areal functional parameters/indices to analyze the wear and lubrication behavior was studied via confocal scanning microscopy. It was observed that the applied mechanical surface post-treatments decreased the average surface roughness parameters. The values of the area surface roughness parameters are the highest for shot peening and lowest for multi-pin ultrasonic impact peening. The results showed that the ultrasonic finishing post-treatments provided a decrease in the area surface roughness Sa parameters magnitudes by 3–6 times as compared to the LPBF-built parts. The formation of surface microrelief by peening techniques leads to improved functionality-related performance in the LPBF-fabricated superalloy parts.

Keywords: *LPBF post-processing, Inconel 718, ultrasonic shot peening; multi-pin ultrasonic impact peening; shot peening; 3D surface roughness, functional parameters*

ON THE DESIGN OF EXPERIMENTS METHODOLOGY FOR THE OPTIMAL DESIGN OF A NEW MACHINERY

Salvio Veneziano[1], Marco Claudio De Simone[2]
[1]MEID4 Academic Spin-Off of the University of Salerno, Fisciano, Italy
[2]Department of Industrial Engineering, University of Salerno, Fisciano, Italy

Salvio Veneziano

Marco Claudio De Simone

ABSTRACT:
The object of this study concerns the validation of the DOE (Design Of Experiments) methodology applied to the optimal design of new machines. In particular, this technique was tested on an aging test machine for a new class of intelligent railroad seats. The authors intend to implement this technique using the proprietary software Minitab. Instead, Matlab computational software was chosen to emulate the machine in a virtual environment to test the various configurations considered for statistical analysis. Following the numerical analysis, this method was tested on the physical prototype recently built in the Applied Mechanics Laboratory of the Department of Industrial Engineering at the University of Salerno. The use of DOE on the real machine revealed a lack of correlation between the main measured quantities, thus highlighting the incorrect distribution of the assumed transducers. This information allowed to redefine the sensors to be installed, improving the performance of the instrumented seat.

Keywords: *DOE, Minitab, Multibody, Matlab, Dynamics, Machines*

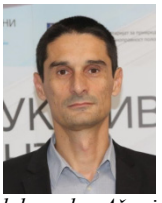
1. INTRODUCTION

A planned statistical experiment consists of a series of trials in which certain process input variables are deliberately made to vary so that corresponding changes in the system's response can be observed and identified [1-3]. The Design of Experiments technique, unlike the traditional COST (Change Only one Separate factor at a Time) approach, which bases the search for the optimum by changing sequentially and individually each variable, changes all factors simultaneously, allowing the overall optimal solution to be found faster [4]. This technique makes it possible to replace experimental tests with mere numerical simulations, significantly reducing the cost of designing and running the experiments [5, 6]. In the traditional method, the experimenter goes by trial and error, changing the value of only one controllable variable at a time. Instead, the Design of Experiments technique creates a symmetrical distribution of experiments around the central point, changing all factors simultaneously [7]. The methods of statistical programming of experiments can be used in both the development and fine-tuning of a process to improve its performance and also to obtain a process that is robust to external sources of variability [8].

ELECTRODE SELECTION FOR WIRE-CUT ELECTRICAL DISCHARGE MACHINING PROCESS

Do Duc Trung[1], Aleksandar Ašonja[2], Duong Van Duc[1], Nong Thi Thanh Nga[1]
[1]Hanoi University ofIndustry, Schoolof Mechanical and Automotive Engineering, Vietnam
[2]University Business Academyin Novi Sad, Faculty of Economics and Engineering Management in Novi Sad, Republic of Serbia


Do DucTrung


Aleksandar Ašonja


Duong Van Duc


Nong Thi Thanh Nga

ABSTRACT:
The electrode is a very important component of the wire-cut electrical discharge machining (WEDM) process. The selection of electrodes will greatly influence both economic and technical indicators of the machining process. This study was conducted to select the best electrode among six available types. To choose the best option among available options, ranking the options is necessary. Four different methods were used to rank the options including the TOPSIS method, the PIV method, the COCOSO method, and the CURLI method. Six criteria were used to describe each electrode type including wire diameter, breaking load, maximum tension, elongation, conductivity, and price. The MEREC method was used to calculate the weights for the criteria. Although the ranking of electrode types were performed by using four different methods (TOPSIS, PIV, COCOSO, and CURLI), in all four cases, the same good electrode was identified.

Keywords: *electrode selection, WEDM, MCDM, TOPSIS method, PIV method, COCOSO method, CURLI method, MEREC method*

1. INTRODUCTION

WEDM is a non-traditional machining method that has been widely used in recent years [1]. WEDM has outstanding advantages such as being able to process profiles with complex shapes, low error rates, high machining accuracy, short production cycles, and low production costs [2]. For thin sheet parts, if traditional cutting and machining methods (turning, milling, etc.) are used, the parts are susceptible to warping. In this case, *WEDM* will be used as the best alternative [3]. Because the nature of the *WEDM* process is that the metal of the workpiece is melted and evaporated, this method does not depend on the hardness of the part. Because of this, the *WEDM* method can be used to machine all types of materials with different hardness. This is also an outstanding advantage of the *WEDM* method compared to traditional machining and cutting methods [4].

THE COMPARISON OF THE FRACTURE BEHAVIOR OF WELD METAL IN P235GH STEEL PIPES WITH VARYING GEOMETRICAL DIMENSIONS AND UTILIZED WELDING TECHNOLOGIES

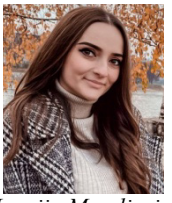
POREĐENJE LOMNOG PONAŠANJA METALA ZAVARA UZORAKA ČELIČNIH CIJEVI OD P235GH SA RAZLIČITIM GEOMETRIJSKIM DIMENZIJAMA I PRIMJENJENIM TEHNOLOGIJAMA ZAVARIVANJA

Bajtarević-Jeleč Amna[1] , Aleksija Đurić[2], Nedeljko Vukojević[1], Lamija Mešeljević[1]
[1]Faculty of Mechanical Engineering, University of Zenica, Zenica, Bosnia and Herzegovina*
[2]Faculty of Mechanical Engineering, University of East Sarajevo,
East Sarajevo, Bosnia and Herzegovina


Amna Bajtarevic-Jelec


Aleksija Djuric


Nedeljko Vukojevic


Lamija Meseljevic

ABSTRACT:
In this paper, a comparison of fracture behavior of P235GH steel pipe weld metal samples was performed. The pipe diameter, weld thickness, and applied welding technology in the observed welded material samples vary. The analysis was carried out for both working and welding residual stress conditions. For the purpose of the analysis, various values of the pipe internal pressure as working stresses were considered. Through the use of the incremental hole drilling methodology, the residual stresses were determined and used in the investigation. The fracture behavior was analyzed by application of SINTAP methodology using FAD concept. Parameters needed for FAD concept were specified by experimental tests and numerical calculations using finite element method.

Keywords: *fracture behavior, residual stress, SINTAP, FAD*

REZIME:
U radu je izvršeno poređenje lomnog ponašanja uzoraka metala zavara na čeličnim cijevima od materijala P235GH. Varirani parametri su prečnik cijevi, debljina zavara i primjenjena tehnologija zavarivanja u posmatranim zavarenim uzorcima. Analiza je provedena u uslovima i radnih i zaostalih napona koji nastaju kao posljedica zavarivanja. U cilju analize, razmatrane su različite vrijednosti unutarnjeg pritiska koji djeluje unutar cijevi kao radno opterećenje. Upotrebom metodologije inkrementalnog bušenja rupe, zaostali naponi su određeni i korišteni u istraživanju. Lomno ponašanje je analizirano primjenom SINTAP metodologije uz upotrebu FAD koncepta. Parametri koji su potrebni za FAD koncept su određeni pomoću eksperimentalnih testova i numeričkih proračuna koristeći metodu konačnih elemenata.

Ključne riječi: *lomno ponašanje, zaostali naponi, SINTAP, FAD*

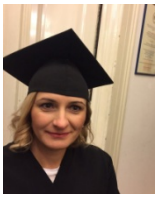
MODELLING HEAT INPUT OF PULSED GMAW AS THE FUNCTION OF WELD GEOMETRY

MODELIRANJE UNOSA TOPLOTE PRI PULSNOM MAG ZAVARIVANJU KAO FUNKCIJE GEOMETRIJE SPOJA

Petar Tasić[1], Ismar Hajro[1], Almira Softić[1]
[1]University of Sarajevo – Mechanical engineering faculty,
Sarajevo, Bosnia and Herzegovina


Petar Tasić


Ismar Hajro


Almira Softić

ABSTRACT:
Modern metal fabrication would not be possible without highly efficient welding processes. One of them is Gas Metal Arc Welding (GMAW), which has several variants, including pulsed. Pulsing significantly reduces spatter and is widely used in fully mechanized and robotic welding systems. On the other side, large-scale welding needs adequate and efficient heat input and seam geometry control. This paper presents models describing heat input as the function of required weld geometry. Research has been made using low-alloyed structural steels with two thicknesses, 4 mm and 8 mm, using pulsed GMAW in horizontal position, while models have been developed using statistical tools. This paper elaborates advantages and disadvantages of such approach, as well as comparison with similar concepts available in literature.

Keywords:*heat input, pulsed GMAW, weld geometry, structural steel*

REZIME:
Izrada savremenih metalnih proizvoda je nezamisliva bez visoko-efikasnih procesa zavarivanja. Jedan od njih je MAG, koji ima nekoliko varijanti, uključujući i pulsnu. Uvođenje pulsiranja je značajno smanjilo prskanje i, što je značajnije, omogućilo smanjenje unosa toplote, time smanjujući zaostale napone i deformacije, a u nekim slučajevima i potrebu za naknadnom termičkom obradom. Pulsna varijanta se često koristi u sistemima koji su potpuno mehanizirani ili robotizirani. Sa druge strane, visok obim zavarivanja zahtijeva efektivnu i efikasnu kontrolu i unosa toplote i geometrije spojeva. U ovom radu su predstavljeni modeli koji opisuju unos toplote kao funkciju zahtijevane geometrije zavarenog spoja. Istraživanje je izvedeno na niskolegiranim konstrukcionim čelicima debljine 4 mm i 8 mm, koristeći pulsni MAG u položenoj poziciji, dok je veza između unosa toplote i geometrijskih karakteristika uspostavljena upotrebom statističkih alata. U radu su također opisane i prednosti i nedostaci ovakvog pristupa.

Ključne riječi: *unos toplote, geometrija zavara, pulsiranje, MAG*

IONIC HYDRAULIC FLUIDS AS POTENTIAL HYDRAULICS FLUID FOR AVIATION

JONSKE HIDRAULIČNE TEČNOSTI KAO POTENCIJALNE HIDRAULIČNE TEČNOSTI ZA AVIJACIJU

Darko Lovrec[1], Vito Tič[1]
[1]University of Maribor, Faculty of Mechanical Engineering, Maribor, Slovenia

Darko Lovrec

Vito Tič

ABSTRACT:
In recent decades, ionic liquids, which have excellent individual physicochemical properties, have been increasingly used for various purposes. After more than a decade of development, ionic hydraulic fluids suitable for use in hydraulic systems have also been developed. Due to their excellent properties, they were first successfully used in the field of hydraulic devices in metallurgy. As high-tech hydraulic fluids, they are also suitable for other areas of application, potentially also in the demanding field of aviation. The paper summarizes the excellent properties of ionic hydraulic fluids, also suitable for potential use in the field of aviation. A comparison of the properties of hydraulic fluids currently used in aviation and the current state of the properties of ionic hydraulic fluids gives the current state and possibly the need to improve certain properties.

Keywords: *hydraulic fluids, ionic hydraulic fluids, material properties, areas of use, aviation.*

REZIME:
Poslednjih decenija, jonske tečnosti, koje imaju odlična individualna fizičko-hemijska svojstva, sve više se koriste u različite svrhe. Nakon više od decenije razvoja, razvijene su i jonske hidraulične tečnosti pogodne za upotrebu u hidrauličkim sistemima. Zbog svojih odličnih svojstava, uspješno se koriste u oblasti hidrauličnih uređaja u metalurgiji. Kao visokotehnološke hidraulične tekućine, pogodne su i za druga područja primjene, potencijalno i u zahtjevnom području avijacije. U radu su sumirana izvrsna svojstva jonskih hidrauličnih tekućina, također pogodnih za potencijalnu upotrebu u oblasti avijacije. Poređenje svojstava hidrauličnih fluida koji se trenutno koriste u vazduhoplovstvu i trenutnog stanja svojstava jonskih hidrauličnih fluida daje trenutno stanje i eventualno potrebu za poboljšanjem određenih svojstava.

Ključne riječi: *hidraulične tečnosti, jonske hidraulične tečnosti, svojstva materijala, područja primjene, avijacija.*

EFFECT OF INFILL STRUKTUREON MECHANICAL PARAMETERS OF FDM 3D PRINTED PLA AND PLA+CF MATERIALS: CHARACTERIZATION AND COMPARATIVE ANALYSIS

Emine Hozdić[1], Elvis Hozdić[2]
[1]Kranj School Centre, Kranj, Slovenia
[2]University of Novo mesto, Faculty of Mechanical Engineering, Novo mesto, Slovenia


Elvis Hozdić


Emine Hozdić

ABSTRACT:
This scientific article investigates the impact of different infill structures on the mechanical parameters of Fused Deposition Modeling (FDM) 3D printed materials, specifically polylactic acid (PLA) and polylactic acid reinforced with carbon fibers (PLA+CF). The study involves a comprehensive characterization and comparative analysis of tensile strength, nominal strain at break, and other key mechanical properties. Through a systematic approach, the research aims to provide insights into optimizing the infill structure for enhanced performance and usability of 3D printed products. The comparative analysis includes a detailed examination of PLA and PLA+CF materials, highlighting their distinct mechanical behaviours under varying infill structures. The findings contribute to a deeper understanding of the interplay between infill design and mechanical properties, facilitating advancements in the field of additive manufacturing.

Keywords: *FDM, PLA, PLA+CF, infill structure, mechanical parameters*

REZIME:
Ovaj znanstveni članak istražuje utjecaj različitih struktura ispune na mehaničke parametre materijala izrađenih pomoću3Dtehnologije taložnog očvršćivanja, konkretno polilaktične kiseline (PLA) i polilaktične kiseline ojačane ugljičnim vlaknima (PLA+CF). Studija uključuje sveobuhvatnu karakterizaciju i komparativnu analizu čvrstoće na istezanje, nominalne deformacije pri kidanju i drugih ključnih mehaničkih svojstava. Kroz sistematski pristup, istraživanje ima za cilj pružiti uvid u optimizaciju strukture punjenja radi poboljšane izvedbe i upotrebljivosti proizvoda izrađenih 3D printanjem. Komparativna analiza obuhvaća detaljan pregled materijala PLA i PLA+CF, ističući njihova različita mehanička ponašanja pod različitim strukturama punjenja. Dobiveni rezultati doprinose dubljem razumijevanju međuodnosa između dizajna strukture punjenja i mehaničkih svojstava, olakšavajući napredak u području aditivne proizvodnje.

Ključne riječi: *FDM, PLA, PLA+CF, strukturna punjenja, mehanički parametri*

EXPERIMENTAL STUDY OF TENSILE MECHANICAL PROPERTIES OF FDM 3D PRINTED MATERIAL AND TECHNO-ECONOMIC ANALYSIS USING DEFINITIVE SCREENING DESIGN

EKSPERIMENTALNO ISTRAŽIVANJE ZATEZNIH MEHANIČKIH OSOBINA FDM 3D PRINTANOG MATERIJALA I TEHNO-EKONOMSKA ANALIZA PRIMJENOM DEFINITIVNOG SKRINING DIZAJNA

Alma Idrizbegović[1], Adi Pandžić[1], Zedina Lavić[1], Edin Kadrić[1]
[1]University of Sarajevo – Facultyof Mechanical Engineering, Sarajevo, Bosnia and Herzegovina


Alma Idrizbegović


Adi Pandžić


Zedina Lavić


Edin Kadrić

ABSTRACT:
In this research, we aim to examine the influence of FDM printing parameters on the tensile properties of FDM printed PLA material. Furthermore, we conducted a techno-economic analysis to evaluate the effects of printing parameters on the printing time and material consumption. Definitive screening design (DSD), a relatively new experimental design, is proposed for designing experiments as it enables integration of screening and optimization experiments. Experimental data are analyzed using analysis of variance (ANOVA) and regression analysis to assess the effects of seven FDM printing parameters on three responses, ...
Mathematical models, obtained by regression analysis, are verified using new experimental measurements. Verification results indicate a satisfactory degree of agreement between model and experimental data, confirming DSD as an effective and promising experimental design method.

Keywords: *FDM, printing parameters, maximum tensile force, printing time, material consumption, definitive screening design, DSD*

SAŽETAK:
Cilj ovog istraživanja je ispitivanje utjecaj aparametara FDM printanja na zatezne osobine FDM printanog PLA materijala. Dodatno je provedena tehno-ekonomsku analiza za procjenu učinaka parametara printanja na vrijeme printanja i utrošak materijala. Definitivni skrinin gdizajn (DSD), relativno novi eksperimentalni dizajn, predložen je kao eksperimentalni dizajn, jer omogućuje integraciju skrining i optimizacijskih eksperimenata. Analiza eksperimentalnih podataka provedena je primjenom analize varijanse (ANOVA) i regresijske analize za procjenu utjecaja sedam parametara FDM prinatanja na tri odgovora, ...
Matematički modeli dobiveni regresijskom analizom verificirani su novim eksperimentalnim mjerenjima. Rezultati verifikacije pokazuju zadovoljavajući stepen slaganja između eksperimentalnih i modelom predviđenih podataka, potvrđujući DSD kao efikasnu i obećavajuću metodu eksperimentalnog dizajna.

Ključne riječi: *FDM, parametri printanja, maksimalna sila zatezanja, vrijeme printanja, utrošak materijala, definitivni skrining dizajn, DSD*

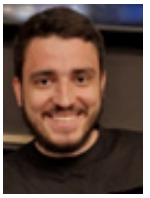
PROPERTIES AND APPLICATION OF WOOD-PLASTICCOMPOSITES OBTAINED BY FDM 3D PRINTING

SVOJSTVA I PRIMJENA DRVO-PLASTIČNIH KOMPOZITA DOBIJENIH FDM 3D PRINTANJEM

Murčo Obućina[1], Seid Hajdarević[1], Sandra Martinović[1], Muhammed Jusufagić[2]
[1]Department of Wood Technology, University of Sarajevo – Mechanical Engineering Faculty, Sarajevo, Bosnia and Herzegovina
[2]Sarajevo – Secondary School for Environment and Wood Design, Sarajevo, Bosnia and Herzegovina


Murčo Obućina


Sandra Martinović


Muhammed Jusufagić

ABSTRACT:
The paper explores the mechanical properties and application of wood plastic composites in the 3D printing industry, focusing on FDM printing technology. The Wood-PLA and Red-PLA materials with three layer heights were tested to determine and compare the mechanical properties of these materials. The results presented in this paper were obtained by testing specimens printed on printers using nozzles with smaller diameters. The results show that Wood-PLA has lower mechanical characteristics than Red-PLA for both, tested flexural and tensile properties. The advantages of Wood-PLA are the aesthetic properties that make the printed objects more natural, and warmer. It is possible to perform texture as in natural wood, and surface laser engraving. The possibility of integrating wood waste into high-profit elements printed by using numerous variations of FDM technologies is a new approach to the development and application of wood plastic composites. It leads to a better utilization of wood residues.

Keywords: *FDM, Wood-PLA, 3D printing, woodplastic composites*

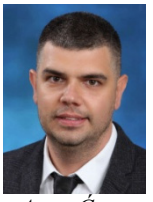
REZIME:
Rad istražuje mehanička svojstva i primjenu drvno-plastičnih kompozita u industriji 3D printanja, fokusirajući se na tehnologiju FDM printanja. Testirani su Wood-PLA i Red-PLA materijali, sa tri visine sloja, kako bi se odredila i uporedila mehanička svojstva ovih materijala. Rezultati, prikazani u ovom radu, dobijeni su ispitivanjem uzoraka printanih na printerimasa mlaznicama manjeg prečnika. Rezultati pokazuju da Wood-PLA ima lošija mehaničkasvojstva na savijanje i zatezanje od Red-PLA. Prednosti Wood-PLA su estetska svojstva koja čine printane predmete prirodnijim i toplijim. Moguće je izvoditi teksturu kao kod prirodnog drveta, kao i površinsko lasersko graviranje. Mogućnost integracije drvnog otpada u visokoprofitne elemente printane korištenjem brojnih varijacija FDM tehnologija je novi pristup razvoju i primjeni drvnoplastičnih kompozita. To dovodi do boljeg iskorištenja drvnih ostataka.

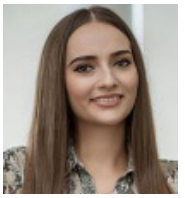
Ključne riječi: *FDM, Drvo-PLA, 3D printanje, drvo-plastični kompoziti*

3D PRINTED TOY WATCH WITH MECHANICAL IRIS

Žiga Alma[1], Ćaro Amer[2], Mešeljević Lamija[1]
[1]University of Zenica, Faculty of Mechanical Engineering, Bosnia and Herzegovina
[2]University of Zenica, Faculty of Philosophy, Bosnia and Herzegovina


Alma Žiga


Amer Ćaro


Lamija Mešeljević

ABSTRACT:
The paper describes toy watch with mechanical iris. The motion of the outer ring counterclockwise uniformly rotates the five petals about each of their pivots. That reveals tiny secret compartment in the watch and, with child's imagination, allows the power magic beams to spread out.
For children, mechanical flower, imbedded in watch, is mesmerizing by itself. For adults looking for explanations, kinematic analysis of iris mechanism is presented.

Keywords: *toy watch, mechanical iris, five petals, 3D printing, kinematics*

SAŽETAK:
U radu je opisan sat igračka s mehaničkim irisom. Okretanje vanjskog prstena u smjeru suprotnom od kazaljke na satu ravnomjerno rotira pet latica oko njihovih osovinica. To otkriva malu tajnu pregradu u satu i, uz dječju maštu, omogućuje širenje moćnih magičnih zraka.
Za djecu je mehanički cvijet, ugrađen u sat, sam po sebi očaravajući. Za odrasle koji traže objašnjenja, prikazana je kinematička analiza mehanizma irisa.

Ključne riječi: *sat igračka, mehanički iris, pet latica, 3D printanje, kinematika*

1. INTRODUCTION

Mechanical irises are very intricately designed mechanisms that are mesmerizing to see in action. The mechanism with five petals is simple one and it combines natural beauty ofspring flower with the mechanics. The three main parts are fixed ring, petals, and petals actuating ring. During ring rotation these petals open, revealing hidden compartment inside. When this intricate design is combined with children imagination, the magic watch is made.
The paperis a part of the project Mechanical toys intended for Stem education, described in the references[1, 2, 3]. In this paper, the magic of opening the mechanical flower placed in the watchcase will be explained.Fig. 1 shows the kinematic structure of the iris mechanism.

ANALYTICAL INVESTIGATION OF THE TAPERED THREAD HELIX ANGLE

Oleh Onysko[1], Volodymyr Kopei[1], Tetiana Lukan[1], Ivan Havryliuk[1], Yurii Bukatka[1]
[1]Ivano-Frankivsk National Technical University of Oil and Gas, 76019 *Ivano-Frankivsk, Ukraine*


Oleh Onysko


Volodymyr Kopei


Tetiana Lukan


Ivan Havryliuk


Yurii Bukatka

ABSTRACT:
Today, tapered threads are very common in domestic pipe connections and especially in the oil and gas industry. Actually, the oil and gas assortment of connections is responsible for the operational strength of the connection and tightness of a drill-strings and casings. This means that the connectors have to provide significant requirements for the accuracy of the thread. Technological methods and design approaches cannot fully meet such requirements. The reason for this is the lack of accurate theoretical approaches to determine one of the main geometric parameters of a conical thread and the tool for its manufacture - the helix angle. In this research, on the vector and differential basis, the functional dependence of the helix angle on the main parameters of the thread: the pitch, the taper angle, the radius of the smaller base of the cone and the distance from it is obtained.

Keywords: *conical helix, thread turning, cutting edge clearance angle, circle vector functions, differential equations of motion along a helix*

1. INTRODUCTION

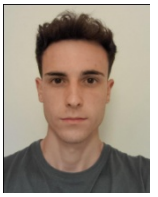
Conical threaded parts are widely used in pipe connections, and especially in the oil and gas production. There, they play an important ecological role, since the amountof emissions into the environment depends on the tightness of these joints in the drill strings [1]. On the other hand, the density of connectors is a strong argument for reducing energy consumption [2, 3]. Designers of drilling tool-joints and wells [4], as well as technologists-experts in the process of hydrocarbon extraction [5] are working on reducing energy consumption for the processes of drilling and oil and gas production. During the construction of threaded pipe joints, calculation methods are improved [4, 5, 6], analytical properties of curves [7, 8] describing threaded joints are studied, new thread designs are developed [7], which ensure the tightness of joints [8, 9], as well as fatigue strength of threaded surfaces [10].

DEVELOPMENT OF A CAD-MBD-FEM MODEL FOR THE DESIGN AND ANALYSIS OF A HELICOPTER TAIL ROTOR SYSTEM

Maria Curcio[1], Rosario La Regina[1], Carlos Pérez Carrera[1], Carmine Maria Pappalardo[1]
[1]University of Salerno, Fisciano, Italy


Maria Curcio Carrera


Rosario La Regina


Carlos Pérez


Carmine Maria Pappalardo

ABSTRACT:
In this paper, a model for the design of the tail rotor of a helicopter is developed.In particular, a CAD-MBD-FEM approach was employed to this end. The starting point of the analysis is the virtual development of the virtual model. Once the virtual prototype was made, it was reworked to make the multibody model, developed through the combined use of MATLAB and SIMULINK, by using the SIMSCAPE MULTIBODY toolbox. The main purpose of this analysis is to calculate the forces that are transferredto the various components in each operating configuration. Finally, the last part of the design strategy focuses on the FEM analysis carried out in ABAQUS.To this end, the output of the multibody analysis is used as input for the subsequent FEM analysis, and this was done in order to determine if the component is statically verified or not.

Keywords: *helicopter, tail rotor, SIMSCAPE MULTIBODY, CAD, MBD, FEM, ABAQUS*

1. INTRODUCTION

Designing a product is a long process, often involving several steps, each with specific outputs to be achieved. Typically, during product engineering there is collaboration and information exchange between designers and analysts. The work of analysts aims to validate the correctness and efficiency of the work of designers, and eventually provide them with guidelines for reworking the design [1-3]. Designers employ CAD (Computer Aided Design) software that are based on the use of NURBS (Non-Uniform Rational B-Splines) [4]. NURBS allow for smooth and elegant curves and surfaces, which ensure an optimal representation of parts. Analysts, on the other hand, are forced to transform these elegant but non-computational representations into finite elements in order to perform FEM (Finite Element Method) [5]. This transformation involves simplifying the complete CAD model, ...

OPTIMIZATION OF END MILLING PARAMETERS USING AFRICAN VULTURE OPTIMIZATION ALGORITHM

OPTIMIZACIJA PARAMETARA VRETENASTOG GLODANJA PRIMENOM ALGORITMA AFRIČKOG LEŠINARA

Mića Đurđev[1], Mijodrag Milošević[2], Dejan Lukić[2], Velibor Premčevski[1]
[1]University of Novi Sad, Technical Faculty "Mihajlo Pupin" Zrenjanin, Serbia
[2]University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia


Mića Đurđev


Mijodrag Milošević


Dejan Lukić


Velibor Premčevski

ABSTRACT:
timization of machining parameters is a crucial aspect of manufacturing processes, aimed at improving efficiency and product quality. A significant body of scientific literature has concentrated on utilizing advanced techniques, for the optimization of various machining parameters. This paper introduces the application of the recently published African Vulture Optimization Algorithm (AVOA) to determine the optimal parameters for the ball-end milling process, including cutting speed, feed, radial depth of cut, and axial depth of cut. The objectives are the minimization of cutting forces and the maximization of the material removal rate. Based on the experimental data from existing literature, this study performs the optimization of machining parameters. After performing comparative analysis, the obtained results are discussed and graphicaly presented. AVOA demonstrated high efficiency in addressing this optimization challenge.

Keywords: *AVOA, metaheuristic, optimization, machining, parameters*

REZIME:
Optimizacija parametara obrade je ključni aspekt proizvodnih procesa, usmjeren na poboljšanje efikasnosti i kvaliteta proizvoda. Značajan dio naučne literature fokusiran je na korišćenje naprednih tehnika za optimizaciju različitih parametara obrade. Ovaj rad predstavlja primjenu nedavno objavljenog algoritma afričkog lešinara (AVOA) za određivanje optimalnih parametara procesa glodanja vretenastim loptastim glodalima, uključujući brzinu rezanja, pomak, dubinu glodanja i širinu glodanja. Ciljevi su minimizacija sila rezanja i maksimizacija proizvodnosti procesa obrade. Na osnovu eksperimentalnih podataka iz postojeće literature, ova studija izvodi optimizaciju parametara obrade. Nakon izvšavanja uporedne analize, rezultati su prodiskutovani i grafički predstavljeni. AVOA algoritam je demonstrirao visoku efikasnost u rješavanju ovog zadataka optimizacije.

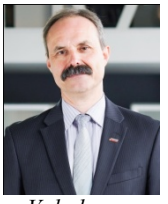
Ključne riječi: *AVOA, metaheuristika, optimizacija, mašinska obrada, parametri*

OPTIMIZATION OF VACUUM-PLASMA COATING APPLICATION TECHNOLOGY BY STRENGTH AND PLASTICITY CRITERIA

Evhen Solovykh[1], Ihor Shepelenko[2], Volodymyr Shumliakivsky[3], Stanislav Katerynych[4], Andrey Solovuc[5]
[1,2,4,5]Central Ukrainian National Technical University, Kropyvnytskyi, Ukraine
[3]Zhytomyr Polytechnic State University, Zhytomyr, Ukraine


Evhen Solovykh


Ihor Shepelenko


Volodymyr Shumliakivsky


Stanislav Katerynych


Andrey Solovuc

ABSTRACT:
The results of multi-criteria optimization of vacuum-plasma coating application modes on titanium alloys as applied to compressor blades of a gas turbine engine are presented. Based on operating conditions and part failures, the parameters of short-term static strength and plasticity were selected as optimization criteria for the technological process of vacuum-plasma coating application. When selecting the controlled parameters, the influence of design, technological and operational factors was taken into account in a complex way. Carrying out the experiment, its statistical analysis allowed to build a regression model of optimization criteria dependencies on design, technological and operational factors. The obtained dependencies adequately describe the process and they can be used for analysis and optimization of the technological process of vacuum-plasma coating application.

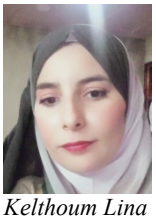
Keywords: *vacuum-plasma coatings, technological process, multi-criteria optimization, strength, plasticity, mathematical model*

1. INTRODUCTION

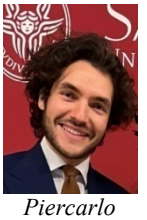
The modern methodology of scientific and experimental studies of multifunctional coatings involves the use of the whole complex of experimental-statistical and computational experimentation methods, study of strength and durability characteristics, X-ray structural and metallographic studies. These methods make it possible to determine the optimal technological modes, by means of which it is possible to obtain a coating with extreme properties and to ensure the ratio of strength and durability characteristics in the composition "base – coating" as close as possible to the optimum, namely maximum strength and durability.In this sense, coating application technology should be considered as a way to control the properties of the surface layer.

B-SPLINE COLLOCATION METHOD FOR THE FOURTH-ORDER DYNAMIC BEAM EQUATION

Kelthoum Lina Redouane[1], Nouria Arar[2], Piercarlo Cattani[3], Francesco Villecco[4]
[1,2]University Constantine 1, Frères Mentouri, Algeria
[3]University of Rome “La Sapienza”, Roma, Italy
[4]University of Salerno, Fisciano, Italy


Kelthoum Lina Redouane


Nouria Arar


Piercarlo Cattani


Francesco Villecco

ABSTRACT:
This study delves into the dynamic behavior of a beam, employing a fourth-order transverse equation featuring constants like elastic modulus and moment of inertia, and variables such aslinear mass density and an applied load expressed as a function of transverse displacement. Our proposed numerical approach utilizes a B-spline-derived basis, ensures meticulous treatment of boundary conditions, and incorporates a higher-order difference scheme. Numerical examples highlight the approach’s versatility and effectiveness, surpassing conventional benchmarks. This study converges mathematical rigor with engineering applicability, offering a comprehensive exploration of dynamic structural analysis.

Keywords: *Beam equation, Transverse displacement, Numerical approximation, B-spline, Higher-order difference scheme.*

1. INTRODUCTION

In the domain of applied science and engineering, numerous physical systems are modeled bysome suitable differential equations either partial or ordinary. However, sometime due to the highnonlinearity and/or complexity of the probems, the analytical solutions are still missing, apart thedifficulty to prove the existence and uniqueness under special boundary– initial conditions. Moreover, the analytical solution is often expressed by some non-elementary functions, special functions, or series so that especially for Engineering applications numerical solution are needed.In fact, thanks tothe advanced development of modern computers, numerical methods emerge as the most efficient toolto easily describe the behaviour of dynamical system and differential problems. One such example isthe elastic beam differential equation, which is derived from the Bernoulli beam’s theory, and it is afundamental theoretical model in structural analysis. This equation plays a crucial role to describe thecharacteristics deformation of beams, bars, ...

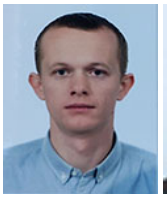
INVESTIGATION IN STRUCTURE OF FUSION ZONE OF WELDED JOINT OF HIGH-STRENGTH STEEL WITH AUSTENITE WELD

Dzyubyk Andrij[1], Lisovska Lidiya[2], Voitovich Andriy[3], Khomych Ivan[4], Soloviov Oleh[5], Dzyubyk Liudmyla[6]
[1,2,3,4,5,6]Lviv Polytechnic National University, 79013 Lviv, Ukraine


Andrij Dzyubyk


Lidiya Lisovska


Andriy Voitovich


Ivan Khomych


Oleh Soloviov

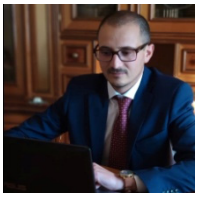

Liudmyla Dzyubyk

ABSTRACT:
Peculiarities of phase-structural composition of the zone of thermal influence for high-strength steel that had been welded by electrodes with austenite structure were studied. Such steels are inclined to formation of cracks as a consequence of action of thermal cycle of welding. The greatest heterogeneity emerges in the re-gion of transition from the main metal to the weld, i. e. near-boundary zone of fu-sion. For determining the dimensions of this hear-boundary zone, the following determining factors should be taken into account: chemical compositions of the metals joined, intensity of diffusion processes of weldpool and adjacent regions of main metal, that was in solid-liquid state. Therefore, for identification of such a region, methods of X-ray microanalysis are mainly used (X-ray spectrometry). Taking into account small dimensions of the fusion zone, for its study we used method of contact local thermoelectromotive force. It is based on the effect of emergence of thermoelectromotive force at the instant of contact of a heated rod of a thermometer probe with investigated surface. For better identification of characteristics of the near-boundary region, a combination of this method with measuring the microhard zone of thermal influence of the welded joint was used. It is shown that it is possible to take into account different nature of formation of regions of incomplete fusion of main metal and that of hear-boundary region, dif-ferent chemical compositions, properties and peculiarities of formation of struc-ture in this zone. The verification of the results obtained was carried out by means of X-ray microanalysis.

Keywords: *Fusion zone, welded joint, high-strength steel, thermal influence*

DESIGN OF AN INTRINSICALLY STABLE MOTION DEVICE FOR BUILDING SITE ELEVATORS

Lorusso Angelo[1], De Simone Marco Claudio[1]
[1]Department of Industrial Engineering, University of Salerno, Fisciano, Salerno, Italy



Angelo Lorusso

Marco Claudio De Simone

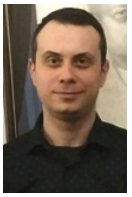
ABSTRACT:
This paper analyzes the introduction of a new handling system for construction site elevators, suitable for moving people and materials. More specifically, the aim is to introduce an inherently stable mechanism capable of introducing a high degree of safety during the use of the machinery.
Currently, the system that allows the movement of the cabin exploits the coupling of an electric motor with a pinion at the end that meshes on a rack, perfectly welded on the column's main structure. The latter is identified as a trellis with a triangular or sometimes square geometric shape, subdivided into modules to allow transport and adaptation according to the height needs to be reached. The electric motor provides fixed torque, both during the movement of the elevator and when the stopping point is reached, in the form of a braking system. If the motor cannot deliver such torque, safety devices will take over. Such a mechanism is called parachute, nothing more than a second pinion placed below the main one, always engaged with the rack. In case of emergency, it is activated for stopping, according to the provisions of the regulations, the cab.
In this paper, the authors analyze a solution that exploits a screw and nut mechanism for cabin movement. The choice falls on this specific coupling since it is an irreversible mechanism in which spontaneous retrograde motion can be stopped without externally applied forces.
The model presented will take advantage of a rack-and-pinion system, as in present devices normally used in construction sites, but with a helical gear type that will mesh with a finite screw. After careful dimensioning, the system will undergo kinematic and dynamic analysis to make the model applicable under real-world conditions.

Keywords: *Coupled systems, safety, irreversible mechanism, SimScape, Multibody*

CONTACT PERFORMANCE, FAILURE MECHANISMS, AND TOOTH LOAD-CARRYING CAPACITY OF THE SELF-MATED PVDF GEAR PAIRS

KONTAKTNE PERFORMANSE, MEHANIZMI OTKAZIVANJA I NOSIVOST ZUBA U ZAHVATU PVDF ZUPČANIKA

Enis Muratovic[1], Adil Muminovic[1], Adis J. Muminovic[1], Nedim Pervan[1]
[1]Department of Mechanical Design, Faculty of Mechanical Engineering, University of Sarajevo, Bosnia and Herzegovina


Enis Muratovic


Adil Muminovic


Adis J. Muminovic


Nedim Pervan

ABSTRACT:
In this paper, extensive testing of the self-mated Polyvinylidene Fluoride (PVDF) gears has been conducted to understand the performance of this polymer material in gear drive real-life applications. The experimental testing has been carried out on a test rig specially developed for incremental load testing, i.e. step testing which is suitable for the engagement of two polymer materials. Incremental load testing procedure enables the establishment of numerous design parameters for polymer gears such as tribological compatibility, endurance limits, parameters of tooth load-carrying capacity, etc. To establish the relevance of the investigated material in gear drive applications, parallel testing is performed for the self-mated Polyoxymethylene (POM) gear samples.

Keywords: *PVDF, gear applications, incremental load testing, design parameters*

REZIME:
U ovom radu provedna su opsežna ispitivanja zahvata Polivinildin Florid (PVDF) zupčanika u cilju shvatanja performasni analiziranog materijala u stvarnim aplikacijama zupčanika. Eskperimentalno testiranje je provedno na ispitnom psotolju, posebno uspostavljenom za izvođenje inkrementalnih testova tj. step testova koje je pogodno za ispitivanje dva polimerna zupčanika u zahvatu. Inkrementalno testiranje omogućava uspostavljanje brojnih konstrukcionih parametera polimernih zupčanika kao što su tribološka kompatibilnost, granice otkazivanja, parametri nosivosti zuba itd. Kako bi se uspostavila opravdanost analiziranog materijala u aplikacima prenosa kretanja, paralelno testiranje je provedeno na zahvatima Polioksimetilen (POM) zupčanika.

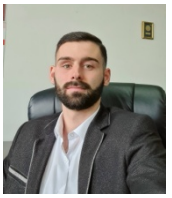
Ključne riječi: *PVDF, primjena zupčanika, inkrementalni testovi, konstrukcioni parametri*

OPTIMISATION OF FIBER LASER CUTTING OF STAINLESS STEEL USING TOPSIS - SHANNON ENTROPY METHOD

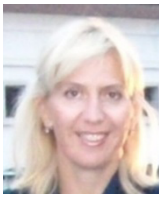
OPTIMIZACIJA REZANJA FIBER LASEROM NEHRĐAJUĆEG ČELIKA PRIMJENOM TOPSIS - SHANNON ENTROPY METODE

Derzija Begic-Hajdarevic, Kenan Muhamedagic, Ahmet Cekic andMaida Cohodar Husic
University of Sarajevo - Faculty of Mechanical Engineering, Sarajevo, Bosnia and Herzegovina


Derzija Begic-Hajdarevic


Kenan Muhamedagic


Ahmet Cekic


Maida Cohodar Husic

ABSTRACT:
Fiber laser cutting can be applied to achieve a very precise cut of various material by selecting the appropriate cutting parameters. In this study, the influence of three main cutting parameters including laser power, assist gas pressure and cutting speed on the cut quality performance during laser cutting of stainless steel was analyzed. TOPSIS-Shannon entropy method based on Box-Behnken experimental design was applied to find optimal combination of cutting parameters. The optimal cutting condition was obtained at 1000 W of laser power, 320 mm/s of cutting speed and 1.5 bar of assist gas pressure.

Keywords: *fiber laser, stainless steel, cut quality, TOPSIS, Shannon entropy.*

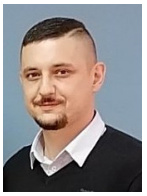
REZIME:
Fiber laser se može koristiti za postizanje veoma preciznog reza kod različitih materijala odabirom odgovarajućih parametara rezanja. U radu je analiziran uticaj tri glavna parametra rezanja, uključujući snagu lasera, pritisak pomoćnog gasa i brzinu rezanja na kvalitet reza pri rezanju laserom nehrađajućeg čelika. Primijenjena je TOPSIS-Shannon entropy metoda zasnovana na Box-Behnken-ovom dizajnu eksperimenta za pronalaženje optimalne kombinacije parametara rezanja. Optimalni uvjeti rezanja postignuti su pri snazi lasera od 1000 W, brzini rezanja od 320 mm/s i pritisku pomoćnog gasa od 1.5 bar.

Ključne riječi: *fiber laser, nehrđajući čelik, kvalitet reza, TOPSIS, Shannon entropy.*

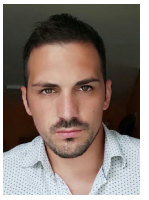
BUILDING COMPETITIVENESS IN INDUSTRY 5.0: THE ROLE OF AI IN IMPROVING PRODUCTION EFFICIENCY

STVARANJE KONKURENTNOSTI U INDUSTRIJI 5.0: ULOGA VEŠTAČKE INTELIGENCIJE U UNAPREĐENJU EFIKASNOSTI

Luka Đorđević[1], Mihalj Bakator[1], Borivoj Novaković[1], Mića Đurđev[1]
[1]University of Novi Sad, Technical faculty “Mihajlo Pupin” in Zrenjanin, Republic of Serbia


Luka Đorđević


Mihalj Bakator


Borivoj Novaković


Mića Đurđev

ABSTRACT:
This study investigates the integration of Artificial Intelligence (AI) within the framework of Industry 5.0, focusing on its important role in improving production efficiency. The paper systematically reviews various AI applications, including predictive maintenance, quality control, supply chain optimization, and smart manufacturing, illustrating their transformative effects on industrial processes. It highlights how AI-driven methods not only increase efficiency but also promote sustainable and human-centric industrial practices. The study provides insights into the challenges and potential of AI in reshaping the industrial landscape, underscoring the balance between technological advancements and ethical considerations. The main goal of the study is to develop a model for improving competitiveness of enterprises. The model is generic in nature and provides a significant insight into the complex dynamics of AI application in enterprises within the context of Industry 5.0.

Keywords: *competitiveness, Industry 5.0, AI, production efficiency*

REZIME:
Ovaj rad istražuje integraciju veštačke inteligencije (AI) u okviru Industrije 5.0, fokusirajući se na njenu važnu ulogu u poboljšanju efikasnosti proizvodnje. U radu se sistematski razmatraju različite aplikacije veštačke inteligencije, uključujući prediktivno održavanje, kontrolu kvaliteta, optimizaciju lanca snabdevanja i pametnu proizvodnju, ilustrujući njihove transformativne efekte na industrijske procese. Ističe se kako metode vođene veštačkom inteligencijom ne samo da povećavaju efikasnost već i promovišu održive industrijske prakse koje su usmerene na čoveka. Rad pruža uvid u izazove i potencijal veštačke inteligencije u preoblikovanju industrijskog okruženja, naglašavajući ravnotežu između tehnološkog napretka i etičkih razmatranja. Osnovni cilj rada je razvoj modela za unapređenje konkurentnosti preduzeća. Model je generičke prirode i pruža značajan uvid u složenu dinamiku primene veštačke inteligencije u preduzećima u kontekstu Industrije 5.0.

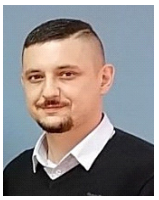
Ključne riječi: *konkurentnost, Industrija 5.0, veštačka inteligencija, efikasnost proizvodnje*

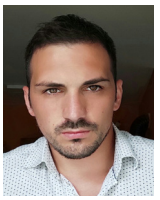
USING MEALPY OPEN-SOURCE LIBRARY FOR OPTIMIZATION OF CONSTRAINED ENGINEERING PROBLEMS

PRIMJENA MEALPY OPEN-SOURCE BIBLIOTEKE ZA OPTIMIZACIJU USLOVNIH INŽENJERSKIH PROBLEMA

Mića Đurđev[1], Luka Đorđević[1], Borivoj Novaković[1], Dalibor Šeljmeši[1], Velibor Premčevski[1]
[1]University of Novi Sad, Technical Faculty "Mihajlo Pupin" Zrenjanin, Serbia


Mića Đurđev


Luka Đorđević


Borivoj Novaković


Dalibor Šeljmeši


Velibor Premčevski

ABSTRACT:
Metaheuristic algorithms are widely used in the scientific community, with numerous algorithms inspired by various sources. Python programming language has become a valuable tool for implementing these algorithms in scientific research. This study uses the MEALPY Python open-source library to solve two constrained optimization problems from existing literature. The concept of the library is explained, and results for problems related to welded beam design and speed reducer design are obtained. Eight swarm-based algorithms from the library are selected for the comparative analysis. The results are compared and graphically presented in several figures. Discussion regarding the best fitness values, convergence, exploration and exploitation percentages, runtime, and trajectory of agents is made before concluding the study.

Keywords: *MEALPY, metaheuristic, algorithm, constrained, optimization*

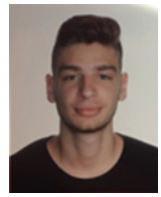
REZIME:
Metaheuristički algoritmi široko su korišćeni u naučnoj zajednici, sa brojnim algoritmima inspirisanim različitim izvorima. Python programski jezik postao je vrijedan alat za implementaciju ovih algoritama u naučnim istraživanjima. Ova studija koristi MEALPY Python open-source biblioteku za rješavanje dva problema uslovne optimizacije iz postojeće literature. Koncept biblioteke je objašnjen, a rezultati za probleme vezane za dizajn zavarenog nosača i dizajn reduktora brzine su dobijeni. Iz biblioteke je izdvojeno osam algoritama zasnovanih na roju koji su upotrebljeni u uporednoj analizi. Rezultati su upoređeni i prikazani na nekoliko grafova. Potom je izvršena diskusija o najboljim vrijednostima funkcije prilagođenosti, zatim konvergenciji, postotcima istraživanja i eksploatacije, trajanju izvršavanja i putanji agenata. Nakon toga dat je zaključak studije.

Ključne riječi: *MEALPY, metaheuristike, algoritam, uslovni problem, optimizacija*

DESIGN OF A DYNAMIC ABSORBER FOR A VIBRATING FRAME WITH THREE DEGREES OF FREEDOM

Angela Donadio[1], Giuseppe Isola[1], Valentino Paolo Berardi[1], Carmine Maria Pappalardo[1]
[1]University of Salerno, 84084 Fisciano, Italy


Angela Donadio


Giuseppe Isola


Valentino Paolo Berardi


Carmine Maria Pappalardo

ABSTRACT:
The study of the mechanical vibrations of a system is important to ensure the safety of a structure. In the field of civil engineering, it is becoming increasingly common to use auxiliary systems called dynamic absorbers, also called Tuned Mass Dampers (TMDs), which are capable of decreasing the vibrations of the main system. They are characterized by mass-spring systems and eventually by a damper. In virtue of the presence of such systems, the operating frequency band of the main structure can be expanded. They are used in civil engineering works to counteract both the action of earthquakes, which cause excitation at the base of the structure, and wind action, which must be taken into account especially in the case of high-rise buildings. In this paper, we will focus on the optimal design of the parameters of a TMD for a vibrating frame with three degrees of freedom. The purpose of this paper is to demonstrate that the Den Hartog method can be generalized for a Multiple Degrees of Freedom (MDF) system. To this end, we will consider the structure subjected to a displacement imposed at the base by an earthquake that occurred in Loma Pietra in 1989. The dynamic analysis of the system was carried out by using MATLAB, while for the realization of the virtual 3D structure we used INVENTOR.

Keywords: *absorber, multiple degrees of freedom (MDF), optimal design, vibrations, TMD, DVA*

1. INTRODUCTION

The purpose of this article is to design the optimal parameters of a passive tuned mass damper for a multiple degrees of fredoom (MDF) frame. In particular, the frame will be subjected to a real earthquake and we will be simulating the dynamic model in MATLAB.Over the years, there have been several studies and researches aimed at finding the optimal values of the parameters of a dynamic absorber connected to a system with one or more degrees of freedom. One of the first authors to deal with the optimization of absorber parameters was Den Hartog[1]. The method he devised is still the most widely used and consists of considering a main one-degree-of-freedom system without damping, connected to an auxiliary system of the mass-spring-damper type[2-4].

ADVANCED ROBOTICS AS THE DRIVE OF INNOVATION: THE ROLE OF THE IMPLEMENTATION OF ADVANCED ROBOTICS IN INDUSTRY 4.0

Isak Karabegović[1], Mehmed Mahmić[2], Edina Karabegović[2], Ermin Husak[2]
[1]Academy of Sciences and Arts of Bosnia and Herzegovina,
Sarajevo, Bosnia and Herzegovina
[2]Univesity of Bihać, Technical faculty Bihać, Bosnia and Herzegovina


Isak Karabegović


Mehmed Mahmić


Edina Karabegović


Ermin Husak

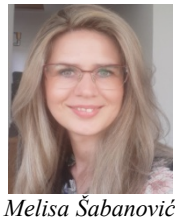
ABSTRACT:
We are witnessing that technological innovations are continuously increasing on annual basis. Major changes are taking place in all industrial branches, new business methods are being introduced, and the existing production processes are being transformed into flexible ones. All these changes are happening due to the implementation of technological innovations that bring advanced technologies such as: advanced robotics, Internet of Things (IoT) , Big Data, computing in the ''cloud'' (Cloud Computing), 3D Printing, Smart Sensors, Radio Frequency Identification (RFID), Virtual and Augmented Reality (AR), Artificial Intelligence (AI), Advanced Security Systems, etc. We are currently in the fourth industrial revolution and Industry 4.0, which is still being debated today with the aim of increasing decision-makers' awareness of its implementation and its multiple impact on increasing competitiveness. The paper describes only one of the basic technologies of Industry 4.0, i.e., advanced robotics, with the aim of educating the world about advanced robotics and its possibilities. The implementation of advanced robotics and the demand for it is expected to have a growing trend in the coming years. Advanced robotic technology is supported by the aforementioned Industry 4.0 technologies, which are implemented in production processes with the aim of obtaining simplified production processes, as well as the procurement and logistics chain. The paper analyzes the trend of applied and approved patents in advanced technology, the trend of demand for advanced robotics on the global market, its role in production processes, as well as the presentation of positive examples of the implementation of advanced robotics.

Keywords: *advanced robotics, robot, innovations, patent, production process*

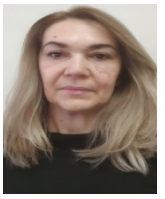
ANALYSIS OF THE CALIBRATION OF DIFFERENT TYPES OF INCUBATORS AND THEIR CALIBRATION DEVIATIONS

ANALIZA KALIBRACIJE RAZLIČITIH TIPOVA INKUBATORA I NJIHOVA ODSTUPANJA PRI KALIBRACIJI

Melisa Šabanović[1], Narcisa Jarović-Bajramović[1]
[1]University of Zenica, Institute „Kemal Kapetanović“ Zenica, Bosnia and Herzegovina



Melisa Šabanović



Narcisa Jarović-Bajramović

ABSTRACT:
The calibration of the incubator is carried out by comparing the calibrated instrument with standards, and from that comparison the deviation of the measuring instrument itself is determined, and then the measurement uncertainty is assessed with those results. When calibrating the incubator, errors (deviations) are determined. Such deviations are very important to determine due to the continued use of incubators for different purposes, such as for medical purposes, and all in order not to endanger human lives. In the incubator during use, due to various influences (for example, humidity, temperature), its accuracy changes. Regular calibration at certain time intervals ensures accuracy, correctness, consistency and traceability. Equipment used for calibration, as well as additional equipment for monitoring, e.g. ambient working conditions, has a significant influence on the accuracy of the calibration results. All the mentioned equipment should be regularly calibrated, in order to be sure of the validity of the obtained results. The mentioned equipment/standards must be calibrated and traceable according to a standard of a higher level of metrology capability.

Keywords: *incubators, calibration, deviations*

REZIME:
Kalibracija inkubatora se provodi na način da se uspoređuju kalibrisani instrument sa etalonima, a iz tog poređenja se utvrdi odstupanje samog mjernog instrumenta i onda se izvrši procjena mjerne nesigurnosti uz te rezultate. Pri kalibraciji inkubatora utvrđuju se greške (odstupanja). Takva odstupanja je veoma važno utvrditi zbog daljeg korištenja inkubatorau različite svrhe kao što su u medicinske svrhe a sve kako ne bi došlo do ugrožavanja ljudskih života. U inkubatoru tokom korištenja zbog raznih uticaja (na primjer, vlaga, temperatura) mijenja njegova tačnost. Redovnom kalibracijom u određenim vremenskim intervalima osigurava se tačnost, ispravnost, dosljednost i sljedivost. Oprema koja se koristi za kalibraciju, kao i dodatna oprema za praćenje npr. ambijentnih uslova rada, ima značajan uticaj na tačnost rezultata kalibracije. Sva navedena oprema treba biti redovno kalibrisana, kako bi bili sigurni u validnost dobijenih rezultata. Navedena oprema/etaloni moraju biti kalibrisani i sljedivi prema etalonu višeg ranga mjeriteljske sposobnosti.

Ključne riječi: *inkubatori, kalibracija, odstupanja*

FREQUENCY CONSTRAINTS IN OPTIMIZATION OF STRUCTURES

FREKVENCIJSKA OGRANIČENJA U OPTIMIZACIJI STRUKTURA

Ermin Husak[1], Mehmed Mahmić[1]
[1]University of Bihać, Technical faculty, Bihać, Bosnia and Herzegovina


Ermin Husak


Mehmed Mahmić

ABSTRACT:
In this paper an example of the optimization of a truss with ten bars with frequency constraints is given. The objective function is the minimum mass of the structure and the variables are the cross sections of ten aluminium bars. The analysis of the dynamic behaviour of the structure was done using the finite element method. Optimization methods of nonlinear programming and genetic algorithms are used. The optimizations were done by changing the values of the natural frequency of the structure as constraints, and the results are given in this paper. From the obtained results, the dependence of the change in the value of the frequency constraints and the mass of the structure can be seen.

Keywords: *structures, truss, optimization, frequency constraints*

REZIME:
U ovom radu dat je primjer optimizacije rešetke s deset štapova s frekvencijskim ograničenjima. Funkcija cilja je minimalna masa strukture, a varijable su presjeci deset aluminijskih štapova. Analiza dinamičkog ponašanja strukture provedena je metodom konačnih elemenata. Koriste se optimizacijske metode nelinearnog programiranja i genetski algoritmi. Optimizacije su provedene promjenom vrijednosti vlastite frekvencije strukture kao ograničenja, a rezultati su prikazani u ovom radu. Iz dobijenih rezultata vidljiva je ovisnost promjene vrijednosti frekvencijskih graničenja i mase strukture.

Ključne riječi: *strukture, rešetka, optimizacija, frekvencijska ograničenja*

OPTIMUM DISTRIBUTION OF DEFORMATIONS WHEN DESIGNING AXISYMMETRICAL OBJECTS

OPTIMALNA RASPODJELA DEFORMACIJA PRI PROJEKTOVANJU OSNOSIMETRIČNIH PREDMETA

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

Mirna Nožić

Himzo Đukić

SAŽETAK::
Kod projektovanja osnosimetričnih predmeta, koji se izrađuju u više operacija, koje su međusobno povezane, ukupna deformacija se mora podjeliti tako da pri izradi ne dolazi do prekida radnog predmeta.
U radu je dat opšti model, koji definiše optimalnu raspodjelu deformacija kod procesa: vučenja žice, izrade cijevi valjanjem, izvlačenja sa redukcijom debljine zida i sličnih procesa.

Ključne riječi*: deformacija, optimalna raspodjela, osnosimetrični predmeti, opšti model, vučenje žice, duboko izvlačenje sa redukcijom debljine zida*

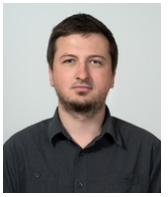
ABSTRACT:
When designing axisymmetric objects, which are made in several operations, which are connected to each other, the total deformation must be divided in such a way that the workpiece does not break during production.
The paper presents a general model, which defines the optimal distribution of deformation during the following processes: wire drawing, pipe rolling, drawing with reduction of wall thickness and similar processes.

Keywords:*deformation, optimal distribution, axisymmetric objects, general model, wire drawing, deep drawing with wall thickness reduction*

ON SOME COMMON CENTRIFUGAL PUMPS NATURAL FREQUENCY ISSUES

O NEKIM ČESTIM PROBLEMIMA SA SOPSTVENIM FREKVENCIJAMA CENTRIFUGALNIH PUMPI

Emir Nezirić[1], Safet Isić[1]
[1]Dzemal Bijedic University of Mostar, Faculty of Mechanical Engineering, Mostar, Bosnia and Herzegovina



Emir Neziric

Safet Isic

ABSTRACT:
Centrifugal pumps are unavoidable parts of hydraulic systems and they are used for transportation of different kinds of fluids from one place to another. Their condition could be monitored and determined by vibration measurements, where common faults are recognizable by standard vibrational characteristics. Natural frequencies of the pump–pedestal structure are unfairly neglected in the available literature. The finite element method is the common method for the pump impeller or the whole pump assembly natural frequency determination and it could be used the same for the pump–pedestal structure natural frequency determination. Two case studies of the natural frequency issues in the centrifugal pumps are shown in this paper. It is shown the importance of the modal analysis of the whole pump–pedestal structure during the design and assembly phase of pumping stations.

Keywords: *centrufugal pumps, natural frequency, vibration analysis*

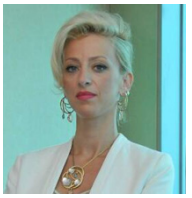
REZIME:
Centrifugalne pumpe su neizbježan dio hirauličnih sistema i one se koriste za transport različitih fluida sa jednog mjesta na drugo. Njihovo stanje može se pratiti i odrediti mjerenjem vibracija, gdje se uobičajene greške mogu prepoznati prema standardnim karakteristikama vibracija. Sopstvene frekvencije sklopa pumpa-postolje su zanemarene u dostupnoj literaturi. Metod konačnih elemenata je čest način određivanja sopstvenih frekvencija rotora pumpe ili čitavog sklopa pumpe i kao takav se može primjenjivati za određivanje sopstvenih frekvencija i sklopa pumpa-postolje. U ovom radu su prikazane dvije studije slučaja problema sopstvenih frekvencija u centrifugalnim pumpama. Prikazan je značaj modalne analize čitavog sklopa pumpa-postolje u toku projektovanja sistema kao i u toku montaže samog sistema.

Ključne riječi: *Centrifugalne pumpe, sopstvene frekvencije, analiza vibracija*

THE EFFECT OF PHANTOM LIMB PAIN ON THE MOVEMENT AND SENSORIMOTOR CONTROL

UTJECAJ FANTOMSKE BOLI NA POKRET I SENZOMOTORNU KONTROLU

Zlata Jelačić
University of Sarajevo, Faculty of Mechanical Engineering, Department of mechanics, Sarajevo, Bosnia and Herzegovina



Zlata Jelačić

ABSTRACT:
This paper aims at investigating the leading mechanisms responsible for the phantom limb syndrome in amputees. Besides thesocial stigmatization that the majority of amputees experience in daily life, there is also the less known problem of the so-calledphantom pain which affects between 76% and 87% of patients post-amputation. The latter is a consequence of a disrupted internalbody representation and is often overlooked when designing prosthetic devices for amputees. We will investigate qualitatively and quantitatively the manner in which the movement andsensorimotor control are affected by the phantom pain during training to restore the muscle tone in remaining body sections. The outcomes should be relevant for both scientific and clinical perspectives ofphantom limb pain treatment as well as smart prosthetic development. As the mechanism behind phantom limb syndrome is not yet fully understood, this project will make a great contribution in that direction, especially in the area of rehabilitation devicedevelopment.

Keywords: *phantom limb pain, amputees, prosthetics*

SAŽETAK:
Ovaj rad ima za cilj istražiti vodeće mehanizme odgovorne za sindrom fantomskog bola. Osim društvene stigmatizacije koju većina amputiraca doživljava u svakodnevnom životu, postoji i manje poznati problem tzv. fantomske boli koja pogađa između 76% i 87% pacijenata nakon amputacije. Ovo je posljedica poremećene interne reprezentacije tijela i često se zanemaruje pri izradi protetskih pomagala. Kvalitativno i kvantitativno ćemo istražiti način na koji fantomska bol tijekom treninga utječe na kretanje i senzomotoričku kontrolu kako bi se vratio tonus mišića u preostalim dijelovima tijela. Ishodi bi trebali biti relevantni i za znanstvene i za kliničke perspektive liječenja fantomske boli udova, kao i za razvoj pametne protetike. Budući da mehanizam iza sindroma fantomskog bola još nije u potpunosti razjašnjen, ovaj će projekt dati velik doprinos u tom smjeru,a posebice u području razvoja rehabilitacijskih uređaja.

Ključne riječi: *fantomska bol u udovima, amputirci, protetika*

SELECTION OF REFRIGERANT FOR DATA CENTER COOLING SYSTEM UTILISING MOORA MCDM METHOD

IZBOR RASHLADNOG FLUIDA SISTEMA HLAĐENJA DATA CENTRA KORISTEĆI MOORA MCDM METOD

Džana Kadrić[1], Rejhana Blažević[1], Ajdin Vatreš[1]and Edin Kadrić[1]
[1]University of Sarajevo – Facultyof Mechanical Engineering, Sarajevo, Bosnia and Herzegovina


Džana Kadrić


Rejhana Blažević


Ajdin Vatreš


Edin Kadrić

ABSTRACT:
This paper presents the findings of a study aimed at identifying the most efficient refrigerant for cooling systems in data centers. Given the high cooling demands of data centers, which result in substantial energy consumption annually, the selection of an optimal refrigerant can significantly decrease energy consumption. The study focused on a data center located in Sarajevo and Design Builder software was used to calculate the cooling load. Five potential alternatives to the current R410A refrigerant were evaluated for a cooling system with a load of 77 kW and a single-stage cooling system with an internal heat exchanger (IHX). The Multi-Objective Optimization on the basis of Ratio Analysis (MOORA) method was used to rank the refrigerants based on six criteria, including technical, environmental, safety, and financial factors. Some criteria, such as environmental impact, safety, and cost, were minimized, while others, like the system coefficient of performance (COP), were maximized. The MOORA method was used to rank the refrigerants and select the one that best meets all the criteria.

Keywords:*data center, refrigerantselection, GWP, COP, MOORA method*

REZIME:
Ovaj rad predstavlja rezultate studije koja je imala za cilj identifikaciju najefikasnijeg rashladnog fluida za hlađenje data centra. S obzirom na visoke zahtjeve za hlađenje data centara, koji rezultiraju značajnom godišnjom potrošnjom energije, odabir optimalnog rashladnog fluida može značajno smanjiti potrošnju energije. Studija se fokusirala na data centar lociran u Sarajevu, a za izračunavanje hladnog opterećenja korišten je softver Design Builder. Pet potencijalnih alternativa trenutnom rashladnom sredstvu R410A su analizirane za sistem sa izračunatim rashladnim opterećenjem od 77 kW i jednostepenim hlađenjem sa unutrašnjim izmjenjivačem toplote (IHX). Metoda Multi-ObjectiveOptimization on thebasisofRatioAnalysis (MOORA) je korištena za rangiranje rashladnih fluida na osnovu šest kriterija, uključujući tehničke, ekološke, sigurnosne i finansijske faktore. Neki kriteriji, kao što su uticaj na okoliš, sigurnost i cijena rashladnog fluida, su minimizirani, dok su drugi, poput koeficijenta performansi sistema (COP), maksimizirani. Metoda MOORA je korištena za rangiranje rashladnih fluida i odabir onog koje najbolje ispunjava sve kriterije.

Ključne riječi: *data centar, izbor rashladnog fluida, GWP, COP, MOORA metod*

ANALYSIS OF QUALITY OF THE INLET WALL MATERIAL

ANALIZA KVALITET MATERIJALA ČEONE STIJENE

Belma Fakić, Adisa Burić, Edib Horoz
Institute “Kemal Kapetanović” of Zenica, University of Zenica
Ulica Travnička cesta broj 7, 72000 Zenica
Bosnia and Herzegovina


Belma Fakić


Adisa Burić


Edib Horoz

ABSTRACT:
The material of the inlet wall of the sleeve is steel casting GS-20Mn5, WNo: 1.1120, according to the standard DIN 17182. The rough cast microstructure of the casting is subject to the appearance of porosity, which, together with coarse non-metallic inclusions and dynamic loading during exploitation, and an improperly performed welding procedure, can adversely affect lifetime of the inlet wall and lead to cracking of the material.

Keywords: *quality, inlet wall, microstructure, non-metallic inclusion, porosity*

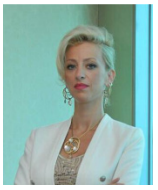
REZIME:
Materijal čeone stijene rukavca je čelični liv GS-20Mn5, WNo: 1.1120, prema standardu DIN 17182. Gruba livena mikrostruktura odlivka podložna je pojavi poroznosti koja zajedno sa grubim nemetalnim uključcima i dinamičkom opterećenju u toku eksploatacije, te nepropisno provedenom postupku zavarivanja može nepovoljno utjecati na životni vijek čeone stijene i dovesti do pucanja materijala.

Ključne riječi: *kvalitet,čeona stijena, mikrostruktura, nemetalni uključak, poroznost*

DESIGNING AND 3D DIGITAL DEVELOPMENT OF A PROSTHETIC PROP BASED ON THE EXAMPLE OF A HUMAN FOOT

DIZAJNIRANJE I 3D DIGITALNI RAZVOJ PROTETSKOG PROIZVODA NA PRIMJERU LJUDSKOG STOPALA

Zlata Jelačić[1], Remzo Dedić[2]
[1]University of Sarajevo, Faculty of Mechanical Engineering,
Sarajevo, Bosnia and Herzegovina
[2]University of Mostar, Faculty of Mechanical, computer and electrical engineering,
Mostar, Bosnia and Herzegovina



Zlata Jelačić

Remzo Dedić

ABSTRACT:
In this paper the process of scanning and 3D printing of a prosthetic foot is presented. The technologies and procedures used to model the prosthetic foot and make the foot are described.
The paper describes 3D scanning, the way it is performed, that is, the 3D scanning procedure and the principle of the scanner. The scanning process is followed by a description of the modeling of the scanned foot in the GOM software, after which the 3D printing of the foot proceeds. The left foot is printed, which is obtained by copying the right foot and finishing it in the software. The work ends with certain conclusions that were made based on everything described.

Keywords: *3D scanning, prosthetic foot, 3D printing*

REZIME:
U ovom radu prikazan je proces skeniranja i 3D printanja protetskog stopala. Opisane su tehnologije i postupci modeliranja protetskog stopala i izrade stopala.
U radu je opisano 3D skeniranje, način na koji se ono izvodi, odnosno postupak 3D skeniranja i princip rada skenera. Nakon procesa skeniranja slijedi opis modeliranja skeniranog stopala u GOM softveru, nakon čega se pristupa 3D printanju stopala. Printa se lijeva noga koja se dobiva kopiranjem desne noge i doradom u softveru. Rad završava određenim zaključcima koji su doneseni na temelju svega opisanog.

Ključne riječi: *3D skeniranje, protetsko stopalo, 3D printanje*

COMPARATIVE ANALYSIS OF VEHICLE DECELERATION MEASUREMENT DEVICES

KOMPARATIVNA ANALIZA UREĐAJA ZA MJERENJE USPORENJA VOZILA

Jasmin Šehović[1], Mirsad Trobradović[1]
[1]Department for Engines and Vehicles, University of Sarajevo - Faculty of Mechanical Engineering, Sarajevo, Bosnia and Herzegovina,


Jasmin Šehović


Mirsad Trobradović

ABSTRACT:
Analysis of vehicle deceleration as one of the key parameters of vehicle safety and performance, and the method of determining it, is a very common topic. This paper provides a theoretical analysis of deceleration as one of the vehicle parameters, and emphasizes various applications of this parameter. Deceleration as a parameter is not only important when determining the vehicle's braking efficiency but its analysis can also provide additional interesting information. The key item is the correct determination of the deceleration under experimental conditions. Thus far, inertial devices for measuring deceleration, which are quite impractical for handling, maintaining and analyzing the measured data, have been used the most. In this paper, a comparative analysis of this device is performed with new devices for measuring deceleration based on GPS and MEMS (Micro Electro Mechanical System) technology. The result of this research provides an answer as to whether the use of devices based on new data acquisition and processing technologies is justified, or whether outdated technologies should still be used.

Keywords:*Deceleration, Vehicle, Inertia, Decelerometer, GPS, MEMS.*

REZIME:
Analiza usporenja vozila kao jednog od ključnih parametra sigurnosti i performansi vozila, te način njegovog određivanja je veoma česta tema. Ovaj rad daje teoretsku analizu usporenja kao jednog od parametara vozila, te naglašava razne primjene ovog parametra. Usporenje kao pšarametar nije bitan samo sa stanovišta određivanja efikasnosti kočenja vozila, već se njegovom analizom mogu dobiti i druge zanimljive informacije. Ključna stavka je ispravno određivanje usporenja u eksperimentalnim uslovima. Do sada su najčešće bili korišteni inercioni uređaji za mjerenje usporenja, koji su dosta nepraktični za rukovanje, održavanje i analizu dobivenih podataka. U ovom radu se vrši komparativna analiza ovog uređaja sa novim uređajima za mjerenje usporenja koji su bazirani na GPS i MEMS tehnologiji. Rezultat ovog istraživanja treba da da odgovor da li je opravdano korištenje uređaja baziranih na novim tehnologijama priupljanja i obrade podataka ili se i dalje treba zadržati na prevaziđenim tehnologijama.

Ključne riječi:*usporenje, vozilo, inercija, decelerometar, GPS, MEMS.*

EXPERIMENTAL HEAT TREATMENT OF S355J2H STRUCTURAL STEEL

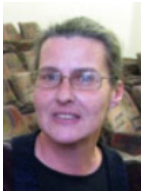
EKSPERIMENTALNA TERMIČKA OBRADA KONSTRUKCIONOG ČELIKA S355J2H

Faruk Razic[1*], Miralem Burek[2], Edin Dziho[2], Sabina Serdarevic – Kadic[3]
[1]Defense Techologies Department, Faculty of Mechanical Engineering Sarajevo, University of Sarajevo, Sarajevo, Bosnia and Herzegovina*
[2]Pretis d.d., Vogosca, Bosnia and Herzegovina
[3]Faculty of Mechanical Engineering, Dzemal Bijedic University of Mostar, Bosnia and Herzegovina
[4]Defense Techologies Department, Faculty of Mechanical Engineering Sarajevo, University of Sarajevo, Sarajevo, Bosnia and Herzegovina


Faruk Razic


Miralem Burek


Edin Dziho


Sabina Serdarevic - Kadic

ABSTRACT:
This paper observes experimental heat treatment of S355J2H structural steel and effects of that treatment on mechanical properties of the material. For this analysis, 44 hollow cylindrical specimens are observed of which 22 are heat treated. Specimens with highest and lowest hardness from both groups are separated and prepared for analysis of mechanical properties. It can be seen that hardness and both, yield strength and tensile strength are significantly increased whilst elongation and cross-sectional area reduction was decreased after material heat treatment.

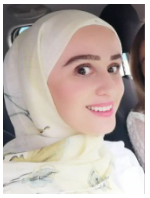
Keywords: *structural steel, heat treatment, hardness, yield strength, tensile strength,*

REZIME:
Ovaj rad se bavi eksperimentalnom termičkom obradom konstrukcionog čelika S355J2H i uticajem izabrane termičke obrade na mehaničke karakteristike materijala. Za potrebe eksperimentalnog ispitivanja izrađena su 44 šuplja cilindra od kojih su 22 termički obrađena. Za provjeru mehaničkih karakteristika izdvojeni su uzorci sa najvećom i najmanjom tvrdoćom. Rezultati pokazuju da je nakon termičke obrade došlo do povećanja tvrdoće, granice razvlačenja i zatezne čvrstoće te smanjenja duktilnosti.

Ključne riječi:*konstrukcioni čelik, termička obrada, tvrdoća, zatezna čvrstoća, granica razvlačenja,*

DISRUPTIVE TECHNOLOGIES THROUGH THE LENS OF APPLICATIONS IN THE AUTOMOTIVE INDUSTRY

Edisa Dreković[1], Žaklina Teofilović[2], Nenad Jovanović[3]
[1]Faculty of Economics, University of Niš, Niš, Serbia
[2]Faculty of Economics, University of Belgrade, Belgrade, Serbia
[3]Shenchi Automotive parts d.o.o, Kragujevac, Serbia


Edisa Dreković


Žaklina Teofilović

Nenad Jovanović

ABSTRACT:
The automotive industry is one of the industries where disruptive technologies are most applied, from product research and development, design, and manufacturing to sales and after-sales services. The market for electric and autonomous vehicles is constantly growing, and automotive companies in the digital transformation process to achieve success have partnered with technology companies to develop virtual factories and deploy the metaverse. This paper explores the applications of various technologies in the automotive industry, including AI/ML, Big Data and Analytics, Cloud Computing and Cloud Manufacturing, Automation and Robotics, Internet of Things (IoT) and Industrial Internet of Things (IIoT), Cyber-Physical Systems (CPS), Cyber safety, additive manufacturing (3D printing), VR/AR, and Digital Twins. Also, the benefits of using these technologies and the implementation challenges associated with each of them are identified. The empirical part of this research aimed to determine the extent to which automotive companies in Serbia use modern technologies. For these purposes, a survey questionnaire was used. The study identified the level of technology implementation and the effects of implementation on the operational and financial performance of the company, as well as the performance of employees. In addition, the research highlighted challenges in implementing these technologies and determined the current level of digital investments in these companies. Additionally, research also examined whether and how parent companies support the digital transformation of these companies in the Republic of Serbia.

Keywords: *automotive industry, disruptive technologies, implementation, benefits, challenges, automotive industry Serbia*

CONSTRUCTION OF VENDING MACHINE OPERATED BY ARDUINO MICROCONTROLLER

Murić Rijad[1], Vojić Samir[1], Ismet Fatkić[1]
[1]University of Bihać, Bihać, Bosnia and Herzegovina


Rijad Murić


Samir Vojić


Ismet Fatkić

ABSTRACT:
Mechatronics consists of an integration of mechanical engineering with electronics and computer systems. The word mechatronics is made by combining the words mechanics and electronics. Mechatronics is a branch of engineering which combines many fields of mechanics and electronics. This work will explain one of those examples of mechatronics systems, and that is the vending machine. An example of mechanics in this work is a conversion of rotational movement to translation movement via a helicoil spring which rotates with the help of the step motor and usesthe potential energy of the coin when sorting in the money mechanism, and the examples of electronics are electronic components such as step motor, Arduino microcontroller, push buttons etc. The machine works by inserting a certain amount of money through the opening intended for it which the sensors will read and print on screen the amount of money that is currently in the machine. If the condition is fulfilled, that is if the machine has enough money we need for the product, by pressing the push button, which is positioned in respect to the product position in the vending machine, the machine will dispense the required product. This work will also show the schematic representation of connecting electronic components and the very construction and assembly of the vending machine.

Keywords: *Arduino, step motor, LCD screen, MDF, LED diode*

1. INTRODUCTION

The first vending machine was built by the Greek mathematician and engineer Hero of Alexandria. His vending machine had the purpose of dosing the holy water. The machine would accept coins and would dose the holy water. The coin would fall into the pan which was connected to the lever. The lever, by using the coin’s weight, opened the valve for dispensing holy water. The lever would continue to move all the way until the coin fell out of the pan and after that, the lever would return to its initial position which would end the dosing of water [1].
Today, vending machines are present in almost all of the countries in the world and even specialized vending machines exist which deviate from traditional products such as snacks and drinks.

APPLICATION OF VARIOUS TYPES OF FIBER REINFORCED MATERIAL IN TIMBER STRUCTURES

PRIMJENA POLIMERA OJAČANIH VLAKNIMA U DRVENIM KONSTRUKCIJAMA

Merima Salčin[1], Fuad Ćatović[2], Edin Džiho[3]
[1,2]Dzemal Bijedic University of Mostar, Faculty of Civil Engineering, Mostar, Bosnia and Herzegovina
[3]Dzemal Bijedic University of Mostar, Faculty of Mechanical Engineering, Mostar, Bosnia and Herzegovina


Merima Salčin


Fuad Ćatović


Edin Džiho

ABSTRACT:
Improvements of mechanical characteristics in existing timber structures has an increasing application. There are numerous studies on the application of FRP materials as reinforcement in timber structures. The use of FRP has gained importance because it is a light material with very high mechanical performance, due to its strength and stiffness. The origin of the fibers in the composite material is of great importance when choosing the reinforcing material in timber constructions. Today, there are FRP materials on the market that are made of synthetic fibers, natural fibers, and more recently hybrid fibers (combination of synthetic and natural fibers). As a result of inadequate maintenance of timber constructions, biological deterioration of wood occurs, which significantly affects the load-bearing capacity of the wooden element in the structure. The paper presents various techniques for strengthening timber elements, which can be applied in already existing timber structures.

Keywords: *timber, FRP reinforcement, beam, flexural behaviour, capacity*

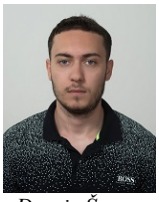
REZIME:
Poboljšanje mehaničkih karakteristika u postojećim drvenim konstrukcijama ima sve veću primjenu. Postoji jako veliki broj istraživanja primjene FRP materijala kao ojačanja u drvenim konstrukcijama. Primjena FRP dobila je na velikom značaju jer je to lagan materijal sa jako visokim mehaničkim performansama, zbog čvrstoće i krutosti. Porijeklo vlakana u kompozitnom materijalu od velikog je značaja kod odabira ojačavajućeg materijala u drvenim konstrukcijama. Danas na tržištu postoje FRP materijali koji su napravljeni od sintetičkih vlakana, prirodnih vlakana , a u novije vrijeme i hibridna vlakna (kombinacija sintetičkih i prirodnih vlakana). Uslijed neadekvatnog održavanja drvenih konstrukcija dolazi do biološkog propadanja drveta, koje bitno utiče na nosivost drvenog elementa u konstrukciji. U radu su prikazane različite tehnike ojačanja drvenih elemenata, koje je moguće primjeniti u već postojećim drvenim konstrukcijama.

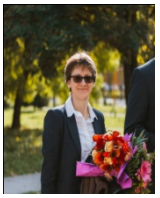
Ključne riječi: *drvo, FRP ojačanje, greda, ponašanje pri savijanju, nosivost*

SELECTION OF THE OPTIMAL HOUSEHOLD HEATING AND COOLING SYSTEM IN HERZEGOVINA USING THE SIMPLEX METHOD FROM THE COST ASPECT

IZBOR OPTIMALNOG SISTEMA GRIJANJA I HLAĐENJA U HERCEGOVINI SIMPLEX METODOM SA TROŠKOVNOG ASPEKTA

Damir Špago[1], Halima Hadžiahmetović[2], Safet Isić[3], Almina Prevljak[4]
[1,3,4]”Džemal Bijedić” University of Mostar – Faculty of Mechanical Engineering, Mostar, Bosnia and Herzegovina
[2]University of Sarajevo – Faculty of Mechanical Engineering, Sarajevo, Bosnia and herzegovina


Damir Špago


Halima Hadžiahemtović


Safet Isić


Almina Prevljak

ABSTRACT:
The paper determined the optimal system for covering the heating and cooling energy needs of a small household in the Herzegovina region using the Simplex method. For the purposes of implementing optimization using the Simplex method, the energy needs of the household were determined using standards such as EN 12831, VDI 2078 and EN13790. The global function of optimization was the Net present cost of the system, where the investment, operating and fuel costs of the considered technologies were analyzed to cover the needs. The optimization results showed that the best solution for covering the customer's needs is the air-water heat pump with an installed power of 6 kW.

Keywords:*Simplex, heat pumps,optimization, household.*

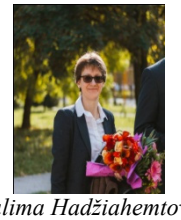
REZIME:
U radu je utvrđen optimalan sistem za pokrivanje energetskih potreba za grijanje i hlađenje malog domaćinstva u Hercegovačkoj regiji primjenom Simplex metode. Za potrebe implementacije optimizacije Simplex metodom, energetske potrebe domaćinstva određene su primjenom standarda kao što su: EN 12831, VDI 2078 i EN 13790. Globalna funkcija cilja optimizacije bilu su Neto sadašnji troškovi sistema. Analizirani su troškovi investicije, rada i goriva razmatranih tehnologija kako bi se pokrile potrebe za energijom. Rezultati optimizacije su pokazali da je najbolje rješenje za pokrivanje potreba investitora toplotna pumpa zrak-voda instalisane snage 6 kW.

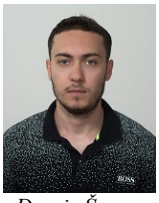
Ključne riječi: *Simplex, toplotne pumpe, optimizacija, domaćinstvo.*

MODELING OF HYBRID ENERGY SYSTEMS BASED ON RENEWABLE ENERGY SOURCES TO COVER THE ELECTRICITY NEEDS OF A HIGHER EDUCATION INSTITUTION USING HOMER PRO SOFTWARE

MODELIRANJE HIBRIDNIH ENERGETSKIH SISTEMA ZASNOVANIH NA OBNOVLJIVIM IZVORIMA ENERGIJE ZA POKRIVANJE POTREBA ZA ELEKTRIČNOM ENERGIJOM VISOKOŠKOLSKE USTANOVE KORIŠTENJEM SOFTVERA Homer PRO

Halima Hadžiahmetović[1], Damir Špago[2], Azrduin Husika[3], Hadiđe Šehić[4]
[1,3]University of Sarajevo – Faculty of Mechanical Engineering, S arajevo, Bosnia and Herzegovina
[2,4] ”Džemal Bijedić” University of Mostar – Faculty of Mechanical Engineering, Mostar, Bosnia and Herzegovina


Halima Hadžiahemtović


Damir Špago


Azrudin Husika


Hadiđe Šehić

ABSTRACT:
The paper presents the optimization of HRES for covering the electricity needs of a higher education institution using Homer Pro software. 6 scenarios with different system costs were modeled (such as sale and purchase prices of electricity as well as the prices of certain technologies) where technologies such as PV panels, small wind turbines, diesel generators, batteries, etc. were taken into account. The optimization results in all scenarios show that the use of batteries is not profitable and that the need for an additional source of energy such as a diesel generator does not exist. The energy and environmental characteristics of the system were analyzed and it was shown that it is possible to achieve the prosumer type for buildings of similar purpose.

Keywords: *Hybrid renewable energy systems, optimization, Homer Pro, Prosumer.*

REZIME:
U radu je prikazana optimizacija HRES-a za pokrivanje potreba za električnom energijom visokoškolske ustanove pomoću softvera Homer Pro. Modelirano je 6 scenarija sa različitim troškovima (kao što su prodajne i nabavne cijene električne energije kao i cijene pojedinih tehnologija) gdje su uzete u obzir tehnologije kao što su PV paneli, male vjetroturbine, dizel generatori, baterije itd. Rezultati optimizacije u svim scenarijima pokazuju da korištenje baterija nije isplativo i da ne postoji potreba za dodatnim izvorom energije kao što je dizel generator. Analizirane su energetske i ekološke karakteristike sistema i pokazalo se da je za objekte slične namjene moguće postići Prosumerski tip ustanove.

Ključne riječi: *Simplex, toplotne pumpe, optimizacija, domaćinstvo.*

SIMULATING THE EFFECT OF ECONOMIC DEVELOPMENT ON THE USE OF RENEWABLE ENERGY IN SOUTHEAST EUROPEAN UNION COUNTRIES

Irfan Djedović[1], Jasna Imamović[1], Lejla Šehanović[2], Nataša Tandir[2]
[1]Department of Banking and Finance, Faculty of Economics and Social Sciences, International Burch University, Ilidža, Bosnia and Herzegovina
[2]Department of Management, Faculty of Economics and Social Sciences, International Burch University, Ilidža, Bosnia and Herzegovina


Irfan Djedović


Jasna Imamović


Lejla Šehanović


Nataša Tandir

ABSTRACT:
This article employs a quantitative approach to examine how the nations in the Southeastern European Union (EU)—Bulgaria, Croatia, Greece, Slovenia, Slovakia, Hungary, and Romaniaare affected by economic growth in terms of their use of renewable energy. The study employs panel data models to examine the connection between the use of renewable energy sources and economic expansion from 2007 to 2020. This research uses Fully Modified Ordinary Least Squares, or FMOLS. The FMOLS results revealed that the utilization of renewable energy is not statistically significantly impacted by real GDP per capita., having enough evidence to not support the conservative hypothesis. Analysis is done using R, SPPS and EViews software programs. The article contributes to existing literature by exploring how economic development influences implementation and usage of sustainable energy in the Southeastern EU countries.

Key words: *use of renewable energy, economic expansion, metric tons of CO2 emissions per person*

REZIME:
U ovom se članku koristi kvantitativni pristup kako bi se ispitalo kako na zemlje jugoistočne Europske unije (EU) — Bugarsku, Hrvatsku, Grčku, Sloveniju, Slovačku, Mađarsku i Rumunjsku utječe gospodarski rast u smislu njihove upotrebe obnovljive energije. Studija koristi panel modele podataka kako bi ispitala vezu između korištenja obnovljivih izvora energije i ekonomske ekspanzije od 2007. do 2020. Ovo istraživanje koristi potpuno modificira neobične najmanje kvadrate ili FMOLS. Rezultati FMOLS-a otkrili su da korištenje obnovljive energije nije pod statistički značajnim utjecajem realnog BDP-a po stanovniku, što ima dovoljno dokaza koji ne podržavaju konzervativnu hipotezu. Analiza se vrši pomoću softverskih programa R, SPPS i EViews. Članak pridonosi postojećoj literaturi istražujući kako gospodarski razvoj utječe na implementaciju i korištenje održive energije u jugoistočnim zemljama EU.

Ključne riječi: *korištenje obnovljive energije, gospodarska ekspanzija, metričke tone emisija CO2 po osobi*

INDUSTRY 4.0 APPROACHES TO THE STANDARDIZATION OF SPUR BEVEL GEARS

Ivanov Viktor[1], Dimitrov Lubomir[2], Ivanova Svitlana[3], Urum Galyna[3]
[1]Odessa National Polytechnic University, 65044 Odesa, Ukraine
[2]Technical University of Sofia, Sofia, Bulgaria
[3]South Ukrainian National Pedagogical University named after K. D. Ushynsky, Odesa, Ukraine


Viktor Ivanov


Lubomir Dimitrov


Svitlana Ivanova


Galyna Urum

ABSTRACT:
Manufacturing technologies and measuring methods of transmissions have undergone great changes, which are usually combined into the concept of Industry 4.0. At the same time, the accuracy standards of bevel gears have remained unchanged for the past ten years. When assembling bevel gearboxes, ANSI/AGMA and ISO standards recommend visual inspection of the contact pattern in the gearing. An additional operation of searching for a satisfactory contact pattern by trial and error method by the operator is also provided. An attempt has been made to regulate installation errors of spur bevel gears, in addition to existing standards, in order to create prerequisites for excluding humans from the assembly process of bevel gears. Mathematical expectation of the load distribution factor was chosen as a criterion for the assembly quality of bevel gears. The probabilistic nature of installation errors was taken into account using the Monte Carlo method. The value of load distribution factor was found depending on the tolerance range for axial displacements and offset error.

Keywords: *Industry 4.0, probabilistic installation errors, spur bevel gears, Monte Carlo method, tolerances allocation.*

1. INTRODUCTION

Compared to cylindrical gears, bevel gears have a more complex design and manufacturing technology, cantilever support assemblies, and greater vulnerability to installation errors. Because of this, it is difficult to achieve an even distribution of the load along the face width. This is especially true for spur bevel gears, in which installation errors usually lead to edge contact of the bevel gear teeth [1]. To reduce the sensitivity of the transmission to these errors, a barrel-shaped tooth profile is used, in which the initial contact occurs at a point in the middle of the face width.

COMPARISON OF BUCKET BRIGADES AND WORKING BALANCE TYPES OF LEAN CELLULAR PRODUCTION

USPOREDBA BUCKET BRIGADES I WORKING BALANCE TIPOVA LEAN ĆELIJSKE PROIZVODNJE

Hadis Bjarić[1], Faris Deraković[1], Faris Ferizbegović[1], Mirza Pašić[1]
[1]Department of Industrial Engineering and Management, Mechanical Engineering Faculty, University of Sarajevo, Sarajevo, Bosnia and Herzegovina


Hadis Bajrić


Faris Deraković


Faris Ferizbegović


Mirza Pašić

ABSTRACT:
The Lean production model, which is based on the cellular organization of production, represents a superior model of production organization accepted by the largest companies from the most organized industries. There are several types of cell production organization. The most common types are Working Balance, Bucket Brigades, Toyota Sewing System, Rabbit Chase, etc. The cellular organization of production enables the elimination of seven types of Lean process losses: transport, inventory, unnecessary movements, waiting, overproduction, overprocessing, and defects. This paper presents the basic principles of lean production with a focus on different types of cellular production organization models. ...
The simulations were preceded by operator training to eliminate the effect of the learning curve on the results of the simulations. The results showed that Bucket Brigades is a superior and more robust model that provides higher productivity. Even in some specific cases, productivity is higher up to 100% compared to the Working Balance concept.
Keywords: *Bucket Brigades, Working Balance, Lean cellular production, productivity,hands-on simulation*

REZIME:
Lean model proizvodnje, koji se bazira na ćelijskoj organizaciji proizvodnje, predstavlja superioran model organizacije proizvodnje prihvaćen od najvećih kompanija iz najorganiziranijih industrija. Postoji više tipova organizacije ćelijske proizvodnje. Najčešći tipovi organizacije su WorkingBalance, BucketBrigades, Toyota sewing system, Rabbitchase i dr. Ćelijska organizacija proizvodnje omogućava eliminaciju 7 procesnih gubitaka: transport, zalihe, nepotrebni pokreti, čekanja, prekomjerni procesi, prekomjerna proizvodnja i defekti. U radu su predstavljeni osnovni principi lean proizvodnje sa fokusom na ćelijsku proizvodnju i različite tipove organizacije ćelijske proizvodnje. ...
Simualcijama je prethodila obuka operatera u cilju eliminacije efekta krive učenja na rezultate simulacija. Rezultati simulacija su pokazali da je Bucket Brigades superiorniji i robusniji model koji u pravilu daje veću produktivnost. Za neke karakteristične slučajeve produktivnost je veća i do 100% u odnosu na Working Balance koncept.
Ključne riječi: *Bucket Brigades, Working Balance, Lean ćelijskaproizvodnja, produktivnost, hands-on simulacije*

ACCURACY OF LARGE-PITCHSCREWTHREAD MANUFACTURED WITH THE DOUBLE-POINT LATHE CUTTING TOOL. KINEMATIC STUDY.

Oleh Onysko[1], Volodymyr Kopei[1], Iuliia Medvid[1], Roman Farulik[1], Iurii Matei[1]
[1]Ivano-Frankivsk National Technical University of Oil and Gas, Ivano-Frankivsk, Ukraine


Oleh Onysko


Volodymyr Kopei


Iuliia Medvid


Roman Faryliuk


Iurii Matei

ABSTRACT:
The production of large-step threads, for example for conical drill-string tool-joints locks, is done with the help of lathe cutting-tool. However, a double-thread lathe cutter should be more productive for this purpose. However, such types of tools are not supplied by modern tool manufacturers really. Apparently, it is due to the lack of investigation of the process of the thread profile accuracy ensuring. The article theoretically investigates the phenomenon of longitudinal displacement of the obtained threaded profile, which occurs as a result of kinematic leading and lagging of the opposite flanks profile of the cutting edge. It has been proven that the resulting offset does not actually affect the accuracy of the thread profile.

Keywords: *kinematic analysis of turning accuracy, turning threads, inclination angle of the cutting edge, large-pitch tapered thread, helix angle*

1. INTRODUCTION

Extractiveindustries are often associated with environmental protection issues [1] and are an influential factor in the concept of sustainable development of oil and gas regions, such as the Carpathian region, which is an important natural factor in Eastern Europe [2, 3]. Screw threads with a large pitch are the most responsible part of drill strings, which are hundreds in every oil and gas well [4]. One of the ways to reduce the environmental negative consequences of drilling processes is to comprehensively increase the tightness of the connection of drill string elements [5], increase the stability of drill pipes and their threaded connections, including in the conditions of aggressive environments of wells [6]. The effectiveness of drill-string connections actually depends not only on their mechanical stability or chemical resistance, ...

FATIGUE LIFE ANALYSIS OF GANTRY CRANE

ANALIZA VIJEKA ZAMORA PORTALNE DIZALICE

Viktor Strelbitskyi[1], Liubov Bovnegra[2], Raul Turmanidze[3]
[1]Odessa National Maritime University, Ukraine
[2]Odessa National Polytechnic University, Ukraine
[3]Georgian Technical University (GTU), Faculty of Transportation and Mechanical Engineering, Tbilisi, Georgia


Viktor Strelbitskyi


Liubov Bovnegra


Raul Turmanidze

ABSTRACT:
Gantry cranes are widely used in ports for transshipment of building materials, containers, lumber and other cargo. They are usually used in open-type warehouses, their advantages include ease of manufacture and operation, short installation time. The results of this study represent a base for future predictions for the number of attacks and ransomware strains. In the study of defects in metal structures of gantry cranes, the parameters of crack resistance are determined, on the basis of which their resource is determined. From the obtained experimental kinetic diagrams of the fatigue fracture of the material, it was found that an increase in the asymmetry of the load cycle leads to an intensification of crack growth, in particular, in the range of values K=11...21 MPa·m$^{1/2}$, the speed increases by 1.3-2 times. At R=0.6, there is already no crack closure effect, a decrease in the fatigue threshold, and an intensification of crack growth over the entire ΔK range. This is consistent with the data on the kinetics of fatigue crack growth at the Peris site.

Keywords: *gantry crane, defect, fatigue crack, operating time.*

REZIME:
Portalne dizalice široko se koriste u lukama za pretovar građevinskog materijala, kontejnera, drvne građe i drugog tereta. Obično se koriste u skladištima otvorenog tipa, njihove prednosti uključuju jednostavnost proizvodnje i rada, kratko vrijeme ugradnje. Rezultati ove studije predstavljaju osnovu za buduća predviđanja broja napada i sojeva programa otkupnine. Pri proučavanju nedostataka metalnih konstrukcija portalnih dizalica određuju se parametri otpornosti na pukotine na temelju kojih se određuje njihov resurs. Iz dobivenih eksperimentalnih kinetičkih dijagrama loma zamora materijala utvrđeno je da povećanje asimetrije ciklusa opterećenja dovodi do intenziviranja rasta pukotina, posebno u rasponu vrijednosti od 5=11...21 Mpa·m$^{1/2}$ brzina se povećava za 1,3-2 puta. Na R=0,6 već nema učinka zatvaranja pukotine, smanjuje se prag umora i povećava se rast pukotine u cijelom rasponu od 5. To je u skladu s podacima o kinetici rasta pukotina od zamora na mjestu MK.

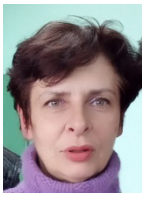
Keywords: *portalna dizalica, kvar, pukotina od umora, radno vrijeme.*

GEOMETRIC MODEL OF NC12 TOOL-JOINT THREAD TURNING WITH A DOUBLE-POINT TOOL

Oleh Onysko[1], Volodymyr Kopei[1], Lolita Pitulei[1], Iurii Matei[1], Roman Farulik[1]
[1]Ivano-Frankivsk National Technical University of Oil and Gas, 76019 *Ivano-Frankivsk, Ukraine*


Oleh Onysko


Volodymyr Kopei


Lolita Pituley


Iurii Matei


Roman Farulik

ABSTRACT:
3D geometric modelling of thread turning processes is an important tool for studying the accuracy of the obtained screw surface. This is especially relevant in relation to the responsible drill-string tool-joints, the manufacture of which requires significant productivity. A study of the effect of high-performance double-edged cutters on the accuracy of one of the technologically most complex NC12 tool-joint threads proved the absolute suitability of the double-point cutting insert for these purposes. The work also carried out 2D geometric modelling of the process of forming this thread, which, together with the algorithm for profiling tool-joint threads previously developed by the authors, actually confirmed the correlation of the results of the accuracy analysis of the profile obtained with the help of the developed models and the specified algorithm.

Keywords: *threading, convolute screw, inclination angle, deviation, thread profile*

1. INTRODUCTION

Screw connections in drill strings are very common conical threaded pairs of the nipple-coupling type. A comprehensive list of environmental, operational and technological requirements is set for them. Environmental requirements are, first of all, hydraulic losses of drilling fluids [1] and their pollution of the environment [2,3]. Since the drill string consists of hundreds of threaded connectors, it is clear that the volume of energy and environmental losses largely depends on their perfection [4]. The operational characteristics of drill strings actually also largely depend on threaded connections, and more precisely on their quality [5] and accuracy [6]. The technology of tool-joint threads manufacturing must ensure the quality and accuracy of threaded connections [7]. On the other hand, the manufacturing technology should contribute to the maximum productivity of the production of precise drill-string tool-joints [8], since thousands of oil and gas wells repeatedly use several hundreds of screwed together pipes.

ANALYSIS AND MODELING OF DISSIPATIVE TOWERS FOR SEISMIC PROTECTION OF BUILDINGS

Marco Claudio De Simone[1], Giampiero Celenta[2], Domenico Guida[1]
[1]Department of Industrial Engineering, University of Salerno, Fisciano, Italy
[2]MEID4 Academic Spin-Off of the University of Salerno, Fisciano, Italy


Marco Claudio De Simone


Giampiero Celenta


Domenico Guida

ABSTRACT:
The present work aims to demonstrate the advantages of using a seismic protection system with dissipative towers and, at the same time, the design of the mechanism that makes it possible to dissipate the input energy due to the earthquake. The study in question is carried out by simulation in the Matlab- Simscape environment; in particular, the model describing the real phenomenon was created and, following numerous simulations, it is shown how the addition of a seismic protection system with dissipative towers helps to mitigate the oscillations generated by the seismic phenomenon. For this reason, for newly constructed buildings, efforts are made to ensure seismic isolation through the introduction of special anti-seismic devices interposed between the foundation and the structure; instead, where it is not possible to interpose such devices, such as for existing buildings existing, other solutions, such as the use of dissipative towers, can be adopted.

Keywords: *Passive damping, dissipative devices, seismic retrofitting, dynamics, multibody*

1. INTRODUCTION

It is well known that the main cause of death when an earthquake occurs is due to the collapse of building structures; therefore, the need has arisen to introduce devices to limit the damage caused by the earthquake [1-3].
The system under consideration is used to retrofit existing buildings seismically; mainly, it is often used to seismically retrofit strategic buildings such as schools and hospitals, for which it is more complicated to insert seismic protection devices interposed between the foundations and elevated structure, as their introduction would bring considerable inconvenience due to the interruption of activity or relocation to new locations [4, 5].
Dissipative towers consist of towers, usually of steelwork, rigidly bonded to the building at floor level by rigid pendulum connections. A basement, usually reinforced concrete, is at the base of the tower; below is the mechanism that reduces building oscillations during a seismic phenomenon [6]. This mechanism is characterized by a spherical hinge, which allows the basement to rotate, ...

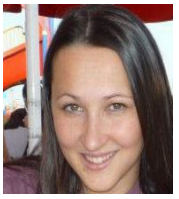
INDUSTRY 4.0 TO SOCIETY 5.0: CHANGE IN PRODUCTION AND MANAGEMENT SYSTEMS

OD INDUSTRIJE 4.0 KA DRUŠTVU 5.0: PROMENE U PROIZVODNIM I UPRAVLJAČKIM SISTEMIMA

Mihalj Bakator[1], Dragan Ćoćkalo[1], Sanja Stanisavljev[1], Stefan Ugrinov[1]
[1]University of Novi Sad, Technical faculty “Mihajlo Pupin” in Zrenjanin, Zrenjanin, Republic of Serbia


Mihalj Bakator


Dragan Ćoćkalo


Sanja Stanisavljev

ABSTRACT:
This paper presents a comprehensive examination of the transition from Industry 4.0 to Industry 5.0. It emphasizes the important role of AI, IoT, and Big Data in redefining production and management systems, fostering a shift towards more personalized, efficient, and sustainable practices. The integration of these advanced technologies while maintaining a human-centric approach is significant for ensuring that technological advancements work in harmony with human creativity and ethical considerations. The study also delves into the aspects of sustainable production, advocating for environmentally friendly practices and the development of collaborative ecosystems. The main goal of the paper is to analyze the importance acheiving competitiveness in the context of Industry 5.0, through AI application. The paper provides a solid basis for future reserach in this domain.

Keywords: *competitiveness, Society 5.0, production and management systems*

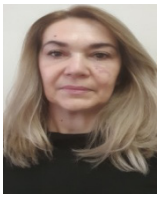
REZIME:
Ovaj rad predstavlja sveobuhvatno ispitivanje tranzicije sa Industrije 4.0 na Industriju 5.0. Rad naglašava važnu ulogu veštačke inteligencije, interneta stvari i velikih podataka u redefinisanju sistema proizvodnje i upravljanja, podstičući prelazak na personalizovanije, efikasnije i održivije prakse. Integracija ovih naprednih tehnologija uz održavanje pristupa usredsređenog na čoveka je značajna za obezbeđivanje da tehnološki napredak funkcioniše u skladu sa ljudskom kreativnošću i etičkim razmatranjima. Studija se takođe bavi aspektima održive proizvodnje, zalažući se za ekološke prakse i razvoj kolaborativnih ekosistema. Osnovni cilj rada je analiza značaja postizanja konkurentnosti u kontekstu Industrije 5.0, kroz primenu veštačke inteligencije. Rad pruža osnovu za buduća istraživanja u ovoj oblasti.

Ključne riječi: *konkurentnost, Društvo 5.0, proizvodni i upravljački sistemi*

INFLUENCE OF THERMOSTATIC CONTRIBUTIONS OF STABILITY AND (IN) HOMOGENEITY ON CALIBRATION RESULTS OF SELF-INDICATING THERMOMETERS

UTICAJ TERMOSTATSKIH DOPRINOSA STABILNOSTI I (NE)HOMOGENOSTI NA REZULTATE KALIBRACIJE SAMOPOKAZNIH TERMOMETARA

Narcisa Jarović-Bajramović[1], Melisa Šabanović[1]
[1]University of Zenica, Institute „Kemal Kapetanović“ Zenica, Bosnia and Herzegovina



Narcisa Jarović-Bajramović

Melisa Šabanović

ABSTRACT:
Calibrations of thermometers are carried out by a comparative method. During calibration the major role has selected calibrated standard-which has traceability towards standard of a higher level of metrology ability. But the major role in calibration has also temperature source-thermostat (the bath in a further text). By usage of different temperature sources-baths, different calibration results are gained. The calibration results represent the established deviation of the thermometers.The significant contributions that are coming from the bath and on which the accent is in are contributions of stability and (in) homogeneity of a bath. The contributions of stability and (in) homogeneity of the used baths are well known, either those were confirmed by measuring or are given by manufacturer. Calibration has been performed at two same calibration temperatures in two baths, same probe is used. It was established that the results gained in one bath were different from those gained in another one and that for is considered that mentioned contributions have influenced on it. That would be presented in this paper.

Keywords: *calibration of thermometers, the heat source- bath, calibration results and deviation of calibration results, influence of stability and (in)homogeneity contributions of baths on calibration results.*

REZIME:
Kalibracije termometara se provode uporednom metodom. Pri kalibraciji veliku ulogu igra odabrani kalibrisani etalon- koji imaju sljedivost prema etalonu višeg ranga mjeriteljske sposobnosti., ali i izvor toplote – thermostat (kupatila u daljem tekstu). Korištenjem različitih izvora temperature-kupatila dobijaju se različiti rezultati kalibracije. Rezultati kalibracije predstavljaju utvrđena odstupanja termometra. Značajni doprinosi koji potiču od kupatila i na kojima je akcenat su doprinosi stabilnost i (ne)homogenost kupatila. Doprinosi nehomogenosti i stabilnosti su za korištena kupatila poznati bilo da su utvrđeni mjerenjem ili su dati od samog od samog proizvođača. Izvedena je kalibracija na dvije iste kalibracione temperature u dva kupatila, korišten je isti etalon i utvrđeno da se dobijeni rezultati u jednom kupatilu i u drugom razlikuju i smatra se da su navedeni doprinosi utjecali na to. U ovom radu će to biti predstavljeno.

Ključne riječi: *kalibracija termometara, izvor toplote - kupatilo, rezultati kalibracije i odstupanja rezultata, uticaj doprinosa stabilnosti i (ne)homogenosti kupatila na rezultate kalibracije.*

EXPERIMENTAL STUDIES OF THE HOLES QUALITY PARAMETERS IN POLYMER COMPOSITE MATERIALS

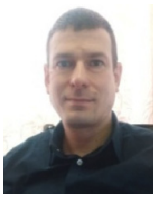
Borys Lupkin[1], Kateryna Maiorova[2], Oleksii Andrieiev[3], Victor Antonyuk[4], Serhii Tolstoi[5]
[1,2]National Aerospace University «Kharkiv Aviation Institute»,
Aircraft Engineering Faculty, Kharkiv,Ukraine
[3]State enterprise "Antonov",, Kyiv, Ukraine
[4]National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”,
Faculty of Instrumentation Engineering, Kyiv, Ukraine
[5]Kyiv Aviation Applied College, Kyiv, Ukraine


Borys Lupkin


Kateryna Maiorova


Oleksii Andrieiev


Victor Antonyuk


Serhii Tolstoi

ABSTRACT:
The subjects of study in the article are quality parameters, namely: geometric accuracy, roughness and shrinkage of holes in polymer composite materials (PCM) obtained by drilling. The study of quality indicators was performed with the help of drilling holes kinematic schemes in PCM. The methods used are the analysis of the quality indicators of PCM openings, the method of expert evaluations. The article deals with the analysis of the movement kinematics for the cutting wedge of the drill in relation to the placement of the PCM filler fibers. Experimental research was carried out on carbon fiber samples with 5 mm holes. Drilling was performed with different types of drills: spiral standard drills P6M5K6 and carbide drills with undercut cutting edges BK8. Measurements of accuracy, roughness, fluffiness and shrinkage of holes were carried out on Faro Fusion Arm, Arbus MP-7 devices and a Zeis Tvoxyp-450 scanning electron microscope. The following results were obtained. According to the analysis and synthesis, the existence of cyclic zones of cutting change, which affect the quality parameters for the machined surface of the holes, was established. The fractographic features of PCM fiber destruction after the drilling process are shown. It was found that when PCM is processed with P6M5K5 drills, the roughness of the holes is lower than when processed with BK8 drills. BK8 drills with an undercut cutting edge have an advantage over P6M5K5 drills. It has been proven that BK8 drills allow to increase strength in point joints of PCM parts by up to 20%. The dependence of the shrinkage for the hole in PCM on the cutting modes was experimentally confirmed.
The results of the research are intended for a wide range of users who specialize in the mechanical processing of PCM when using innovative structural and multi-functional materials.

Key words: *roughness, shrinkage, strength, hole, polymer composite materials, cutting modes.*

STUDY OF HEAT TREATMENT PROCESSES IN THE PRODUCTION OF POROUS THERMAL INSULATION MATERIALS

PROUČAVANJE PROCESA TOPLINSKE OBRADE U PROIZVODNJI POROZNIH TERMOIZOLACIONIH MATERIJALA

Roman Klimov[1], Iryna Sokolovska[1], Predrag Dašić[2,3]
[1]Dniprovsk State Technical University, Kamianske, Ukraine
[2]Engineering Academy of Serbia (IAS), Belgrade, Serbia
[3]SaTCIP Publisher Ltd., Vrnjačka Banja, Serbia


Roman Klimov


Iryna Sokolovska


Predrag Dašić

ABSTRACT:
The properties of porous materials and their areas of usage depend on the chemical composition, thermophysical properties of the components and the manufacturing method: almost all porous thermal insulation materials based on silicates lose their ductility, flexibility and impact strength, become brittle and change their original shape at temperatures above 800 ° C. Therefore, the research and development of equipment and technology for manufacturing materials that can operate under conditions of large temperature ranges, are heat-resistant and do not change the original strength and insulating properties when exposed to high and low temperatures are relevant and require further study. ... Based on the obtained dependencies, we can conclude that the thermal conductivity of the material increases with increasing density. This means that it is necessary to reduce the density of the material while ensuring the required strength in order to obtain a material with better thermal insulation properties.

Keywords: *thermal insulation, porous material, heat treatment, thermal conductivity, design of experiment (DoE).*

REZIME:
Svojstva poroznih materijala i područja njihove upotrebe ovise o kemijskom sastavu, termofizičkim svojstvima komponenti i načinu proizvodnje: gotovo svi porozni termoizolacijski materijali na bazi silikata gube svoju duktilnost, fleksibilnost i udarnu čvrstoću, postaju krti i mijenjaju svoj izvorni materijal. oblik na temperaturama iznad 800°C. Stoga se istraživanje i razvoj opreme i tehnologije za proizvodnju materijala koji mogu raditi u uslovima velikih temperaturnih raspona, otporni su na toplinu i ne mijenjaju izvornu čvrstoću i izolacijska svojstva kada su izloženi visokim i visokim temperaturama. niske temperature su relevantne i zahtijevaju dalje proučavanje. ... Na osnovu dobijenih zavisnosti možemo zaključiti da se toplotna provodljivost materijala povećava sa povećanjem gustine. To znači da je potrebno smanjiti gustoću materijala uz osiguravanje potrebne čvrstoće kako bi se dobio materijal boljih termoizolacijskih svojstava.

Ključne riječi: *toplinska izolacija, porozni materijal, toplinska obrada, toplinska provodljivost, dizajn eksperimenta (DoE).*

AN EVALUATION OF THE PERFORMANCE OF THE ODE SOLVERS IMPLEMENTED IN MATLAB FOR SIMULATING MULTIBODY SYSTEMS

Ömer Ekim Genel[1], Carlos Peréz Carrera[2], Şefika İpek Lök[3], Carmine Maria Pappalardo[4*], Domenico Guida[5]
[1]Istanbul Technical University, Istanbul, Türkiye
[2,4,5]University of Salerno, Fisciano, Italy
[3]Dokuz Eylul University, İzmir, Türkiye


Ömer Ekim Genel


Carlos Peréz Carrera


Şefika İpek Lök


Carmine Maria Pappalardo


Domenico Guida

ABSTRACT:
Ease of modeling and producing accurate results in an acceptable time are two keyexpectations from an environment used for the simulation of multibody systems.The latter is closely related to the solver used by the simulation environment and plays an essential role in evaluating the quality of the simulation process.In this study, the performances of some solvers used in MATLAB, SIMULINK, and SIMSCAPE MULTIBODY environments are investigated and preliminary results are presented. In this vein, three different models of the benchmark problem, which is a two mass-spring system,are developed in MATLAB, SIMULINK, and SIMSCAPE MULTIBODY environments,andthe performances of solvers under considerationarestudied in terms of accuracy and computational time. In the study, the effect of tolerance used in simulations on the integral of the absolute error andcomputational time is considered.

Keywords: *performance evaluation, solver, multibody system, simulation, MATLAB, SIMULINK, SIMSCAPE MULTIBODY*

1. INTRODUCTION

In engineering and science, analyzing the response of the system or the structure being designed or investigatedby usingcomputer methods is todayconsidered a fundamental phase [1-3]. In mechanical engineering, in addition to structuralanalyses [4-6], performing transient dynamic multibody simulations is also anothersignificantstep in evaluating whether the system or the structure being designed exhibits the desired behavior at certain times [7,8]. At this point, MATLAB environments are becoming increasingly preferred software in research communities that need time-domain computer simulations due to their constantly expanding technical and practical capabilities [9,10].

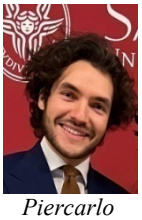
DYNAMICAL BEHAVIOR OF THE FRACTIONAL GOLDBETER-LEFEVER MODEL

Naziha Belmahi[1], Fatiha Mesdoui[2], Andrea Formato[3], Piercarlo Cattani[5], Francesco Villecco[6]
[1]Department of Mathematics, University of Sciences and Technology
Mohammed Boudiaf, Oran, Algeria
[2]Department of Mathematics, Mohamed Seddik Ben Yahia University, Jijel, Algeria
[3]Department of Pharmacy, University of Salerno, Fisciano, Italy
[4]Department of Computer, Control and Management Engineering,
University of Rome “La Sapienza”, Roma, Italy
[5]Department of Industrial Engineering, University of Salerno, Fisciano, Italy


Naziha Belmahi


Fatiha Mesdoui


Andrea Formato


Piercarlo Cattani


Francesco Villecco

ABSTRACT:
Due to the importance of the historical memory in the analysis of a class of dynamical systems, we introduce in this paper a time fractional-order derivative into the Goldbeter-Lefever model, which is ageneralized form of its corresponding first-derivative model. For this system, we investigate the localstability of the proposed system, and we discuss the Hopf bifurcation. Some numerical simulationsare performed to confirm the analytical obtained results.

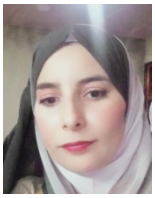
Keywords: *Goldbeter-Lefever model, fractional derivative, stability, Hopf bifurcation.*

1. INTRODUCTION

Exploring the intricate oscillations within cellular processes has captivated researchers, especially concerning glycolysis a recurring phenomenon that has intrigued scientists for decades[1-3].Initially conceptualized by Higgins[4], subsequent revisions by Selkov highlighted limitations, leading to the unveiling of a novel model with a Hopf bifurcation, generating periodic solutions under specific parameters[5-7]. In 1972, Goldbeter and Lefever [8] proposed an ODE-based model encompassing glycolysis and allosteric enzyme reactions, revealing system instabilities that result in dissipative structures over time or space.Recent studies, such as d'Onofrio's investigation [9-11], delved into the dynamical properties of a reduced form of the Golbdeter-Lefever glycolytic model proposed by Keener and Sneyd [12] ...

B-SPLINES NUMERICAL SIMULATION OF BERNOUILLI'S BEAM EQUATION

Kelthoum Lina Redouane[1], Nouria Arar[2], Piercarlo Cattani[3], Francesco Villecco[4]
[1,2]University Constantine 1, Frères Mentouri, Algeria
[3]University of Rome "La Sapienza", Roma, Italy
[4]University of Salerno, Fisciano, Italy


Kelthoum Lina Redouane


Nouria Arar


Piercarlo Cattani


Francesco Villecco

ABSTRACT:
In this paper we give the numerical simulation of the fourth-order transverse equation beam's equation,under the assumptions of elastic modulus, constant mass density and an applied load expressed as afunction of the transverse displacement. In our approach we have used a B-spline basis, combined witha suitable collocation method and finite difference scheme. By a rigorous treatment of the boundaryconditions we have obtained an efficient higher-order method for an accurate numerical solution of thebeam's equation. Some non trivial numerical examples show the high efficiency of our approach, itsversatility and effectiveness, surpassing conventional benchmarks.

Keywords: *Beam equation, Transverse displacement, Numerical approximation, B-spline, Higherorder difference scheme.*

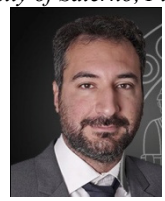
1. INTRODUCTION

In Engineering applications the elastic beam differential equation is a fundamental equation withinthe Bernouilli beams theory and its solution provides useful insights for understanding and predictingdeformation patterns and stress distribution within beams. These insights are pivotal in designingstructures for optimal safety and efficiency across various applications, from bridges and buildings to diverse load-bearing systems[1-3]. The Euler-Bernoulli beam equation, a simplified yet crucial theory in civil engineering, is a fourth-order differential equation of clear practical relevance for the dynamics and statics of beams Although the simple mathematical derivation of this equation, its formulation involves intermediate concepts like bending moments and shear forces [4-6]. The most efficient method to solve numerically a differential equation is to use Spines so that the number of unknown coefficient is strongly reduced. Among the many families of Splines, the cubic B-splines enjoy several useful properties such as their local support and flexibility, allowing for precise approximations of smooth curves.

ENHANCING INSPECTION METHODOLOGYOF SOLAR POWER PLANTS THROUGH INTEGRATED INFRARED THERMOGRAPHY AND 3D DATA FUSION

Caterina Gabriella Guida[1], Marco Limongiello[1]
[1]Department of Civil Engineering, University of Salerno, Fisciano (SA), Italy

Caterina Gabriella Guida



Marco Limongiello

ABSTRACT:
Infrared thermography (IRT) is a non-invasive imaging technique that enables qualitative and quantitative temperature analysis. In some thermographic applications, geometry and spatial relationships are crucial for analyzing surfaces and localizing thermal defects. These include photovoltaic (PV) power generation systems, a rapidly expanding sector in response to the growing demand for renewable energy that requires fast and accurate monitoring technologies for maintenance operations. This research aims to develop a technology to monitor the operation of solar modules and possible anomalies by simultaneously acquiring aerial images by connecting optical and thermal infrared sensors to unmanned aerial vehicles (UAVs), obtaining thermal orthoimages as output. Results indicate significant improvements in accuracy and reproducibility, making this methodological approach a promising option for rapid monitoring compared to other current alternatives, making consumer-grade thermal imaging cameras accessible for thermal orthoimage generation.

Keywords: *Photovoltaic (PV), Infrared Thermography (IRT), Photogrammetry, Structure-from-motion (SfM), Monitoring*

1. INTRODUCTION

Structural health monitoring (SHM) provides real-time information on the health status of structures and enables timely reporting of significant changes in their condition[1], [2]. In recent years, numerous non-destructive testing (NDT) methods have been developed that are essential for rapid and effective inspection and do not involve altering the integrity of the structure under study[3], [4].
Infrared Thermography (IRT) has significantly increased in recent years, mainly due to the advancement of IR cameras and the considerable reduction in their cost[5]. The use of IRTin various applications, regardless of their size, is due to the advantages of use, such as high precision, speed of use and the possibility of carrying out inspections in real time, exploiting the representation in two-dimensional (2D) format (thermal images), without causing emissions of dangerous radiation[6], [7].

GLOBAL SOLAR ENERGY

GLOBALNASOLARNAENERGIJA

Branislav Nedbálek[1], Branislav Dudić [2,3], Pavel Kovač [4], Borislav Savković[5], Dušan Ješić[6]

[1,2]Comenius University Bratislava, Faculty of Management, Bratislava, Slovakia
[3]University Business Academy, Faculty of Economics and Engineering Management, Novi Sad, Serbia
[4,5]University of Novi Sad, Faculty of Technical Sciences, Novi Sad, Serbia
[6]International Technology and Management Academy – MTMA, Novi Sad, Serbia


Branislav Nedbálek


Branislav Dudić


Pavel Kovač


Borislav Savković


Dušan Ješić

ABSTRACT:
In the global environment, the availability of the resource is solar energy as the most important renewable resource that is used for the production of heat and electricity. The supply of non-renewable energy sources is constantly decreasing, and energy obtained from the Sun is inexhaustible, safe and renewable for most of the year. The sun as a source of energy is widely available everywhere in the world. The development of solar energy is a trend all over the world today. Solar systems are used to convert sunlight into thermal energy. The use of renewable energy sources has potential and a great perspective for the future. Investing in solar energy is one way to reduce your dependence on constantly changing energy prices on markets and exchanges.

Keywords: *renewable energy sources, solar energy, solar panels, investment*

REZIME:
U globalnom okruženju dostupnost resursa je solarna energija kao najvažniji obnovljivi resurs koji se koristi za proizvodnju toplotne i električne energije. Snabdevanje neobnovljivim izvorima energije se stalno smanjuje, a energija dobijena od Sunca je neiscrpna, bezbedna i obnovljiva tokom većeg dela godine. Sunce kao izvor energije je široko dostupno svuda u svetu. Razvoj solarne energije danas je trend širom sveta. Solarni sistemi se koriste za pretvaranje sunčeve svetlosti u toplotnu energiju. Korišćenje obnovljivih izvora energije ima potencijal i veliku perspektivu za budućnost. Ulaganje u solarnu energiju je jedan od načina da smanjite svoju zavisnost od stalnih promena cena energije na tržištima i berzama.

Ključne reči: *obnovljivi izvori energije, solarna energija, solarni paneli, investicije*

QUALITATIVE ANALYSIS OF THE CORRELATION BETWEEN HEAT TRANSFER COEFFICIENT AND PRESSURE PULSATIONS

KVALITATIVNA ANALIZA ZAVISNOSTI KOEFICIJENTA PRELAZA TOPLOTE OD PULZACIJA PRITISKA

Nihad Hodzic[1], Kenan Kadic[2]
[1]University of Sarajevo, Faculty of Mechanical Engineering, Sarajevo, Bosnia and Herzegovina
[2]JP Elektroprivreda BiH d.d., Sarajevo, Bosnia and Herzegovina
[2]Power utility, Power plant Kakanj, Kakanj, Bosnia and Herzegovina

Nihad Hodzic

Kenan Kadic

ABSTRACT:
Heat transfer was investigated in the pulsating flow of flue gases generated by the combustion of gaseous fuel in a burner of simple and modular geometry with aerodynamic valves and cooled by water. Based on the measurement data, the dependence of the intensity of heat transfer from the pulsating flow of flue gases to water was established. In addition to the fact that the heat transfer coefficient in the pulsating flow is significantly higher than the same in the developed turbulent flow without pressure pulsations, the qualitative analysis also showed that it depends on the geometry of the burner, the connection of the burner with the rest of the system, the distance between the open end of the resonant tube of the burner and the entrance to the heat exchanger and from the thermal power of the burner. A direct linear correlation was established between the heat transfer coefficient and the total pressure deflection in the flue gases.

Keywords: *combustor, pulsating pressure, heattransfer, heattransfer coefficient*

REZIME:
Prenos toplote je istraživan u pulzirajućem toku dimnih plinova koji su generisani sagorijevanjem gasovitog goriva u gorioniku jednostavne i modularne geometrije sa aerodinamičkim ventilima te hlađenog vodom. Na bazi podataka mjerenja, uspostavljena je zavisnost intenziteta prenosa toplote sa pulzirajućeg toka dimnih plinova na vodu. Osim što je koeficijent prelaza toplote kod pulzirajućeg toka značajno veći od istog u razvijenom turbulentnom toku bez pulzacija pritiska, kvalitativnom analizom je pokazano i da zavisi od geometrije gorionika, veze gorionika sa ostatkom sistema, udaljenosti između otvorenog kraja rezonantne cijevi gorionika i ulaza u izmjenjivač toplote te od termičke snage gorionika. Uspostavljena je direktna linerana korelacija između koeficijenta prelaza toplote i ukupnog otklona pritiska u dimnim plinovima.

Ključne riječi: *gorionik, pulzacije pritiska, prenostoplote, koeficijent prelaza toplote*

THE EFFECT OF OXYGEN CONTENT VARIATION IN THE COMBUSTION ATMOSPHERE ON EMISSION OF POLLUTANTS DURING THE COMBUSTION OF DIFFERENT SOLID FUELS

UTICAJ PROMJENE SADRŽAJA KISEONIKA U ATMOSFERI SAGORIJEVANJA NA EMISIJU POLUTANATA PRI SAGORIJEVANJU RAZLIČITIH ČVRSTIH GORIVA

Kenan Kadic[1] and Nihad Hodzic[2]
[1]JP Elektroprivreda BiH d.d. - Sarajevo, Bosnia and Herzegovina
[1]Power utility Power plant Kakanj, Bosnia and Herzegovina
[2]University of Sarajevo, Faculty of Mechanical Engineering, Sarajevo, Bosnia and Herzegovina

Kenan Kadic

Nihad Hodzic

ABSTRACT:
This paper presents the research results on the influence of oxidant variation on emission of pollutants during the combustion of different solid fuels. The emission of key components of flue gases, NO_x, SO_2, CO_2, and CO, was analyzed during the combustion of specified fuels in air stream (O_2≈21%) and oxygen-enriched stream (O_2=27%) at a process temperature of 1050 °C. Results are provided for three different fuels: brown coal, lignite coal, and waste wood biomass. The research results a substantial influence of oxygen content variation on pollutant emissions across all fuel types. A dedicated section discusses the implications for further carbon dioxide capture, storage, or utilization, including insights into Carbon Capture and Storage or Utilization technology, specifically focusing on the CO_2 component.

Keywords:*emission of pollutants, oxy-fuel combustion, solid fuels, oxygen.*

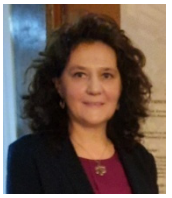
REZIME:
Ovaj rad prikazuje rezultate istraživanja uticaja promjene oksidanta na emisiju dimnih plinova i to pri sagorijevanju različitih vrsta čvrstih goriva. Analizirana je emisija osnovnih komponenti dimnih plinova NO_x, SO_2, CO_2 i CO pri sagorijevanju predmetnih goriva u struji vazduha (O_2≈21%) i u struji obogaćenoj kiseonikom (O_2=27%). Dati su rezultati za 3 različita goriva: mrki ugalj, lignitni ugalj i otpadnu drvnu biomasu, i to za procesnu temperaturu 1050 °C. Rezultati istraživanja jasno pokazuju značajan uticaj promjene sadržaja kiseonika na emisiju svih polutanata i za sve vrste goriva. Sa aspekta daljnjeg izdvajanja i skladištenja ili upotrebe CO_2, odnosno primjene Carbon Capture and Storage or Utilization technology u radu je poseban osvrt dat za komponentu CO_2.

Ključne riječi:*emisija polutanata, oxy-fuel sagorijevanje, čvrsta goriva, kiseonik*

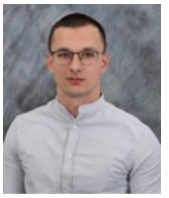
TOWARDS A GREENER FUTURE: SENSOR-BASED MATERIAL CHARACTERIZATION IN WASTE SORTING FOR A SUSTAINABLE RECYCLING MODEL

SENZORSKAKARAKTERIZACIJA MATERIJALA U SORTIRANJU OTPADA ZA ODRŽIVI MODEL RECIKLIRINJA

Lejla Banjanovi-Mehmedovic[1], Nedim Dželilović[1]
[1]University of Tuzla, Faculty of Electrical Engineering, Tuzla, Bosnia and Herzegovina



Lejla Banjanović-Mehmedović



Nedim Dželilović

ABSTRACT:
Waste sorting is a vital part of the circular economy. The issue of waste sorting is very complex in terms of detecting individual types of waste, with the aim of recycling and using them in new products. This paper investigates the efficient sorting of metals, plastics, and glass through the application of three distinct sensors—inductive, photoelectric, and capacitive sensors—with the objective of enhancing the recycling process for these materials..
...
Examining the outcomes of material classification and sorting under various conditions, it is evident that the sorting accuracy circa 90%. Expectations indicate that the deployment of this system will streamline the efficient sorting of metals, plastics, and glass in the recycling process, playing a substantial role in environmental conservation and promoting sustainability within the recycling industry.

Keywords: *circular economy, FPGA, Industry 5.0, recycling, sustanabilty, waste sorting*

REZIME:
Sortiranje otpada je vitalni dio cirkularne ekonomije. Problematika sortiranja otpada je vrlo kompleksna u smislu detektovanja pojedinih vrsta otpada, s ciljem recikliranja i korištenja u novim proizvodima. Ovaj rad istražuje učinkovito sortiranje metala, plastike i stakla korištenjem tri različite vrste senzora — induktivnih, fotoelektričnih i kapacitivnih senzora — s ciljem poboljšanja procesa recikliranja ovih materijala.
...
Promatrajući rezultate sortiranja i razvrstavanja materijala u različitim okolnostima vidljivo je da je tačnost sortiranjaoko 90%. Očekivanja pokazuju da će implementacija ovakvog tipasistema pojednostaviti učinkovito razvrstavanje metala, plastike i stakla u daljem procesu recikliranja, igrajući značajnu ulogu u očuvanju okoliša te promovisati održivost u industriji recikliranja.

Ključne riječi: *cirkularna ekonomija, FPGA, industrija 5.0, recikliranje, održivost, sortiranje otpada*

OPTIMIZED DIGITAL TWIN NETWORKS

Piercarlo Cattani[1], Francesco Villecco[2]
[1]Department of Computer, Control and Management Engineering,
University of Rome “La Sapienza”, Roma, Italy
[2]Department of Industrial Engineering, University of Salerno, Fisciano, Italy

Piercarlo Cattani

Francesco Villecco

ABSTRACT:
In this paper we define an optimized digital twin knowledge network based both on the carrying capacity and preferential attachment. It is a logistic growth scale-free network which solves a min-max problem. The main advantage of this model is to build an integrated system (humans-digital twins) aiming to the max efficiency with limited costs of management.

Keywords: *Digital Twin, Human-machine interaction, smart manufacturing, Industry 4.0, knowledge graph, networks*

1. INTRODUCTION

One of the main tasks for Industry 4.0 is to have asystem where artificial intelligence (*AI*), human (*H*), digital twin (*DT*), which is a replica of human intelligence for optimized functions, are integrated into a unique automatic efficient network systemwith minimal costs (physical, structural, enviromental, economical, sustainable....), and maximal efficiency (maximum profit, failure prediction,...). However, this integrated system is not yet completely and efficiently designed, in the sensethat it is still unclear the playing role and limits of each agent (*H-DT*), so that many functions are not clearly assigned to each agent and correctly distributed among them, with a dispersive and costly redundancy.
An optimal integrated system should be characterized by the minimal number of functions for each agent with high efficiency exchange of information/communication between agents and a minimal complexity.Moreover each system should be prepared to handle the insurgence of unexpected problems , events and thus being able to have new functions able to solve the new incoming problems. So that we should have a dynamical growing model of events and functions with some peculiar characteristics. For instance each agent *H* or *DT*is characterized by a physical carrying capacity to solve problems, so that the number of functions which could be assigned to each agent is limited by an upper threshold [1-3], ...

APPLICATION, CHALLENGES AND THE FUTURE OF NFT TECHNOLOGY
PRIMJENA, IZAZOVI I BUDUĆNOST NFT TEHNOLOGIJE

Savo Stupar[1], Elvir Šahić[1], Mirha Bičo Ćar[1], Maida Cico[2]
[1]University of Sarajevo, School of Economics and Business, Bosnia and Herzegovina
[2]International High School “Bloom”, Sarajevo, Bosnia and Herzegovina


Savo Stupar


Elvir Šahić


Mirha Bičo Ćar


Maida Cico

ABSTRACT:
One of the most significant and newest applications of blockchain technology is NFT (Non Fungible Token) technology. Although this technology has been present since 2014, its significant development begins in 2020 and from that moment it becomes more and more popular, especially in the world of property rights protection, primarily digital property, i.e. digital art. NFT technology can also be used to protect the rights of physical objects (real estate, artistic paintings in physical form, jewelry and other rare or unique artifacts). Irreplaceable tokens, as their name suggests, are unique digital assets that, for whatever reason, have a specific (unique) value. Blockchain technology is rightfully considered a technology that, using cryptographic techniques, ensures that the data stored in the blockchain database (a digital record of a work of art, for example) remains absolutely protected, i.e. unchanged. This further means that once these records are placed on the blockchain, they become an integral part of it (the block chain), so no matter how hard someone tries, they cannot be deleted, modified or change their author or owner.

Keywords*: NFT Technology, Blockchain, Smart Contracts, NFT Minting, Ethereum blockchain*

SAŽETAK:
*Jedna od najznačajnijih i najnovijih primjena blockchain tehnologije jeste NFT (Non Fungible Token) tehnologija. Iako je ova tehnologija prisutna od 2014 godine, njen značajniji razvoj počinje 2020. godine i od tog trenutka postaje sve popularnija, a osobito u svijetu zaštite prava vlasništva prije svega digitalne imovine, odnosno digitalne umjetnosti. NFT tehnologija se može koristiti i za zaštitu prava fizičkih objekata (nekretnine, umjetničke slike u fizičkom obliku, nakit i drugi rijetki, odnosno unikatni artefakti), o čemu će detalljnije biti riječi u tekstu članka. Nezamjenljivi tokeni**,** kao što im i samo ime kaže predstavljaju jedinstvenu digitalnu imovinu koja, iz bilo kog razloga, ima neku specifičnu (unikatnu) vrijednost. Blokchain tehnologija se sa pravom smatra tehnologijom, koja koristeći kriptografske tehnike obezbeđuje da podaci pohranjeni u blockchain bazi posataka (digitalni zapis nekog umjetničkog djela na primjer) ostanu apsolutno zaštićeni, odnosno neizmjenjeni. To dalje znači da jednom kada se ti zapisi postave na blokchain, oni postaju sastavni dio njega (lanca blokova) pa koliko god se neko trudio, ne može ih izbrisati, izmjeniti ili promjeniti njihovog autora, odnosno vlasnika.*

Keywords*: NFT tehnologija, Blockchain tehnologija, Pametni ugovori, Mintovanje NFT-jeva, Ethereum blockchain*

IMPROVING PASSBAND IN COSINE-BASED CIC DECIMATION FILTER WITH IMPROVED WORST-CASE ALIASING ATTENUATION

Gordana Jovanovic Dolecek[1], Isak Karabegovic[2]
[1]Institute INAOE, Puebla, Mexico
[2]Academy of Sciences and Arts of Bosnia and Herzegovina, Sarajevo, Bosnia and Herzegovina

Gordana Jovanovic Dolecek

Isak Karabegovic

ABSTRACT:
This paper presents the design of a compensator for the cosine-based CIC (Cascade-Integrator-Comb) decimation filter proposed in the literature for even decimation factors. This decimation filter improves the worst-case aliasing rejection in the first folding band. Additionally, the aliasing rejection is increased in all odd folding bands using a modified cosine filter. However, as a result, the passband droop is increased compared with the CIC filter. We aimed here to design a compensator to decrease passband droop. We consider the wideband case. The magnitude characteristic of the compensator is composed of two sinusoidal functions. The design parameters are the amplitudes of sinusoidals and the parameter of the modified cosine filter. The designs with multipliers and without multipliers are presented and illustrated with examples. For orders of CIC filter less than six, the maximum passband deviation of the compensated filter is less than 0.05 dB. The complexity of the overall design is expressed in the number of APOS (Adders per Output Sample). The proposed design is compared with the compensated decimation filters from the literature.

Keywords: *decimation, aliasing, decimation filter, CIC filter, compensator, APOS*

1. INTRODUCTION

Decimation filters are widely used in Delta-Sigma Oversampled Analog-Digital Converters, wireless communications, software-defined radio, radars, hearing aids, etc. [1-4]. Decimation changes the sampling rate by an integer factor in the digital domain. Decimation introduces aliasing, which a decimation filter must eliminate. The most simple decimation filter is the CIC (Cascade-Integrator-Comb) filter. It provides natural aliasing attenuation in the bands around the zeros of the CIC filter. Those bands are called folding bands. However, this CIC filter does not provide enough attenuation of aliasing in folding bands. Additionally, the passband characteristic of the CIC is not flat, which may cause a decimated signal to deteriorate.

PREDICTING HOUSEHOLDS' SHORT-TERM POWER CONSUMPTION UTILIZING LSTM

PREDVIĐANJE KRATKOROČNE POTROŠNJE ENERGIJE U DOMAĆINSTVIMA KORISTEĆI LSTM

Grega Vrbančič, Vili Podgorelec, Lucija Brezočnik
Intelligent Systems Laboratory, Faculty of Electrical Engineering and Computer Science, University of Maribor, Slovenia


Grega Vrbančič


Vili Podgorelec


Lucija Brezočnik

ABSTRACT:
Due to the growing trend of power consumption, its efficient planning plays a vital role not only in households but also on a national level and beyond. Numerous methods and approaches have been proposed to tackle the complexities associated with power consumption predictions, yet the challenges persist. In this paper, we focus on short-term household power consumption prediction. For that, we briefly present the current techniques that solve this problem, along with their weaknesses - they are usually highly dependent on the nature of the problem and, more precisely, the data on which they are trained. To address this problem, we propose the LSTM model, which was tested on a real-life household power consumption dataset. The results show that the proposed model performs better than the ARIMA method, one of the most common methods for addressing such tasks regarding MAE, MSE, and RMSE metrics, thus providing more accurate and reliable predictions.

Keywords: *machine learning, electrical energy consumption, short-term prediction, LSTM*

REZIME:
Zbog rastućeg trenda potrošnje električne energije, njezino efikasno planiranje igra ključnu ulogu ne samo u domaćinstvima već i na nacionalnom nivou i šire. Predložene su brojne metode i pristupi za rješavanje složenosti povezanih s predviđanjima potrošnje energije, ali izazovi i dalje postoje. U ovom radu fokusiramo se na kratkoročno predviđanje potrošnje električne energije u domaćinstvu. Zbog toga ukratko predstavljamo postojeće tehnike koje rješavaju ovaj problem, zajedno sa njihovim slabostima – one obično jako zavise od prirode problema i, tačnije, podataka na kojima su obučene. Da bismo riješili ovaj problem, predlažemo LSTM model, koji je testiran na stvarnom skupu podataka o potrošnji energije u domaćinstvu. Rezultati pokazuju da predloženi model radi bolje od ARIMA metode, jedne od najčešćih metoda za rješavanje ovakvih zadataka u pogledu MAE, MSE i RMSE metrika, čime se obezbjeđuju preciznija i pouzdanija predviđanja.

Ključne reči: *mašinsko učenje, potrošnja električne energije, kratkoročno predviđanje, LSTM*

THE IMPACT OF DIGITAL TRANSFORMATION TO THE CRIMINAL LAW ASSETS

Arben Prifti [1]
[1]*Lecturer, Faculty of Law, and Humanities “The Mediterranean University of Albania“, Albania*

Arben Prifti

ABSTRACT:
More than 50 years after the idea of information technology first surfaced in the field of technology, the first step in evaluating criminal laws is to assess the impact this revolution has had on daily life and, consequently, the criminal law that regulates and supervises everything. The immediate and direct safeguarding of the through its digital extension is the focus of the current work. The purpose of this effort is to investigate the relationship between criminal law and digital transformation. A thoughtful examination of the ideas and procedures that have been created recently in relation to the defense of individual rights will be suggested, considering the significant changes that the exponential rise of technology in daily life has brought with it for everyone. When it comes to protecting the legal assets mentioned above, the reviewed literature in the present work suggests that we must first reevaluate them from an innovation and informatic technology standpoint. Criminal law procedures evolve to reflect innovations and technological breakthroughs as society does. These amendments could be made to the procedures conceptually or practically.

Keywords: *digital transformation, criminal law, technology, criminal procedure, evolution*

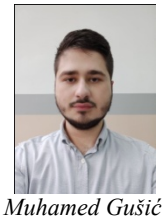
1. INTRODUCTION

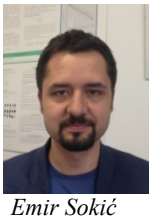
A broadly accepted definition of "Artificial Intelligence" describes it as the branch of computer science that studies the conceptual foundations, methods, and strategies that enable the design of hardware and software systems that may supply the electronic processor with performances that would appear to be exclusively applicable to human intelligence [1;2].Certain of the tasks that are now performed by "artificial intelligence" include producing songs, driving automobiles or drones, diagnosing and identifying photos, translating texts, and cataloging and identifying photographs. We now live in "algorithmic societies," which are centered around the automated decision-making process of digital technology, according to the claim that AI is "*constantly present in our lives thanks to the Internet of Things*" [3; 4; 5;6].

FLEXIBLE AND TRANSPORTABLE ILLUMINATION CONTROL SYSTEM FOR MACHINE VISION APPLICATIONS

FLEKSIBILAN PRENOSNI SISTEM ZA KONTROLU OSVJETLJENJA U APLIKACIJAMA MAŠINSKE VIZIJE

Muhamed Gušić[1], Emir Sokić[2]
[1]Department of Automatic control and Electronics, Faculty of Electrical Engineering, University of Sarajevo, Sarajevo, Bosnia and Herzegovina


Muhamed Gušić


Emir Sokić

ABSTRACT:
During the development of machine vision setups for industrial applications, namely automatic visual inspection systems, the type of required lighting and correct illumination position and intensity is often not known in advance. In order to solve a specific machine vision task, an engineer needs to propose and implement a suitable image processing algorithm and design the accompanying lighting system. Testing different illumination concepts, especially "in the field", using off-the-shelf lighting systems is time consuming. The paper presents a custom-made, cost effective, transportable and flexible system which may be used for testing different illumination techniques and simultaneously control multiple lighting modules. In addition to the hardware part, the developed software used for control the system is presented in the paper. The proposed device usefulness is demonstrated by solving a suitable multi-light digital image processing task.

Keywords: *machine vision, visual inspection, illumination control system, embedded systems, digital image processing*

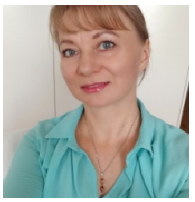
SAŽETAK:
Tokom dizajniranja postavke za sisteme mašinske vizije u industrijskim aplikacijama, posebno u sistemima za automatiziranu vizuelnu inspekciju, vrsta i tačan položaj kao i odgovarajući intenzitet osvjetljenja često nisu unaprijed poznati. Da bi riješio određeni zadatak mašinske vizije, inženjer treba predložiti i implementirati odgovarajući algoritam obrade slike kao i dizajnirati prateći sistem osvjetljenja. Testiranje različitih načina osvjetljenja, posebno "na terenu" pomoću gotovih sistema osvjetljenja je vremenski zahtjevan proces. U ovom radu je predstavljennamjenski izrađen, ekonomičan, prenosiv i fleksibilan sistem koji se može koristiti za testiranje različitih tehnika osvjetljenja kao i istovremenu kontrolu više različitih svjetlosnih modula.. Osim hardverskog dijela, u radu je također predstavljen prateći razvijeni softver koji se koristi za upravljanje. Korisnost predloženog uređaja demonstrirana je rješavanjem odgovarajućeg zadatka digitalne obrade slike korištenjem više izvora svjetlosti.

Ključne riječi: *mašinska vizija, vizuelna inspekcija, sistem kontrole osvjetljenja, ugradbeni sistemi, digitalna obrada slike*

PROMISING AI APPLICATIONS IN POWER SYSTEMS: EXPLAINABLE AI (XAI), TRANSFORMERS, LLMs

Oleh Lukianykhin[1], Vira Shendryk[1, 2, 3], Sergii Shendryk[4], Reza Malekian[2, 3]
[1]Malmö University, 20506,Malmö, Sweden
[2]Sumy State University Sumy, 40007, Sumy, Ukraine
[3]Malmö University, 20506,Malmö, Sweden
[4]Sumy National Agrarian University, Sumy, Ukraine,


Oleh Lukianykhin


Vira Shendryk


Sergii Shendryk


Reza Malekian

ABSTRACT:
This paper aims to analyze and identify the most promising opportunities for Artificial Intelligence (AI) applications in the Power Systems (PS) domain. It identifies major challenges faced in PS and explores the corresponding technical tasks: forecasting and optimal control. Then, the paper investigates the key AI techniques commonly employed in PS for these tasks, e.g. reinforcement learning (RL) and time series forecasting. It also highlights promising methods with great potential in advancing PS solutions: attention-based models (Transformers, LLMs) and explainable AI (XAI) approaches. This study's primary contribution lies in identifying critical research gaps in AI for PS, highlighting areas where research and development may have the biggest impact. Additionally, the paper provides a structured literature overview, serving as a valuable resource for researchers and practitioners in the field.

Keywords: *Power System, Artificial Intelligence, Explainable AI, Transformers, Large Language Models.*

1. INTRODUCTION

The Power System (PS) is a critical infrastructure for modern society, as proper grid functioning is a cornerstone of many industries. However, modern PS faces numerous challenges in energy management [1]. Conceptually, new problems include integrating renewable energy sources [2], smart devices, and microgrids, ensuring privacy, and accounting for stakeholders' interests. New control strategies are needed because of shifts in scale, grid structure, and hierarchy [3]. A power grid is a complex and interconnected system involving various technologies and stakeholders Therefore, research in the PS domain requires a multidisciplinary approach involving collaboration between fields such aselectrical engineering, computer science, economics, and social science. This collaboration can lead to innovative and integrated solutions addressing the PS's challenges and opportunities.

DEVELOPING E-MAIL CLASSIFICATION MODEL USING SENTIMENT ANALYSIS TO IMPROVE CUSTOMER SUPPORT

RAZVIJANJE E-MAIL KLASIFIKACIJSKOG MODELA KORIŠTENJEM SENTIMENT ANALIZE U SVRHU POBOLJŠANJA KORISNIČKE PODRŠKE

Milanović Balić Emina[1]
[1]Department of Information Technology, Faculty of Engineering and Natural Sciences, International Burch University, Sarajevo, Bosnia and Herzegovina

Emina Milanović Balić

ABSTRACT:
Companies often utilize sentiment analysis in aiding their marketing and business strategy, customer service, and much more. More often as they reach a certain amount of users their requests and issues multiply requiring a large customer service team that would be ready to respond. The objective of this paper is to overview different techniques that use sentiment analysis in order to find the best one to build a classification model for customer support e-mails. One of the main factors considered is the domain of the research. With due consideration to various factors and related research, the present study opts for an approach where data preprocessing is prioritized, TF-IDF is used for feature extraction, and SVM for classification. In addition, two types of RNN, a deep learning method, were employed in comparison to SVM for observation, as it has demonstrated effectiveness in similar tasks.

Keywords: *sentiment, analysis, customer support, lexicon, SVM, RNN*

REZIME:
Kompanije se često služe sentiment analizom da bi poboljšali marketing i biznis strategiju, korisničku podršku, te mnogo više. Pretežno kada dostignu određen broj korisnika, njihovi zahtjevi i problemi se umnožavaju što zahtjeva veliki tim korisničke službe u pripravnosti da odgovori. Cilj ovoga rada jeste da pruži pregled različitih tehnika koje koriste sentiment analizu u svrhu određivanja najbolje za izgradnju klasifikacijskog modela za e-mailove korisničke podrške. Jedan od glavnih faktora predstavlja domena istraživanja. Uz dužno razmatranje različitih faktora i povezanih istraživanja, ova se studija odlučuje za pristup u kojem prioritizira pretprocesiranje podataka, te koristi TF-IDF za ekstrakciju karakteristika, a SVM za klasifikaciju. Pored toga, dva tipa RNN-a, metode dubokog učenja koja je pokazala efikasnost u sličnim zadacima, korištena su u poređenju sa SVM-om radi daljeg razmatranja.

Ključne riječi: *sentiment analiza, korisnička podrška , leksikon, SVM, RNN.*

STATISTICAL MODELING OF RANSOMWARE ATTACKS TRENDS
STATISTIČKO MODELIRANJE TRENDOVA RANSOMWARE NAPADA

Milica Tufegdžić[1], Aleksandar Mišković[1], Predrag Dašić[2], Vladimir Nedić[1]
[1]Academy of Professional Studies Šumadija, Kragujevac, Serbia
[2]SaTCIP Publisher Ltd., Vrnjačka Banja, Serbia


Milica Tufegdžić


Aleksandar Mišković


Predrag Dašić


Vladimir Nedić

ABSTRACT:
For the purpose of this study, a dataset is collected from ransomware attacks database, for a six-year period, starting from 2018 to present. The numbers of ransomware attacks for every month and year are counted and visualized in the form of sums. Different linear and nonlinear statistical models are tested and the most reliable trend lines are selected according to criteria of the highest R-squared value (R^2). Trend lines for each of the observed years follow the sextic polynomial curve, with the values of R^2 from 0.6910 to 0.9646. The analysis of the number of attacked sub-industries is conducted and percentage share by sub-industries for each year is calculated. The results are presented separately in the form of graphs for each year, as well as for the six-year period, indicating that the most affected were healthcare, government, and education. The attitude regarding the appearance and trends in frequency of different ransomware strains through the years is also observed. There is no regularity, but it is possible to draw some other trends, with respect to the number of recorded strains. The results of this study represent a base for future predictions for the number of attacks and ransomware strains.

Keywords: *trend line,modeling,cyber-attack, sub-industry, ransomware strain.*

REZIME:
Za potrebe ove studije prikupljeni su podaci iz baze podataka o ransomware napadima, u periodu od šest godina, počevši od 2018. godine, pa do danas. Broj ransomware napada za svaki mjesec i svaku godinu je prikazan zbirno i vizualiziran. Testirani su različiti linearni i nelinearni modeli i odabrane su najpouzdanije linije trendova, na osnovu kriterija najveće vrijednosti R na kvadrat (R^2). Linije trendova za svaku od posmatranih godina su u obliku polinomskih krivulja šestog stepena, sa vrijednostima R^2 u rasponu od 0,6910 do 0,9646. Urađena je i analiza broja podindustrija koje su napadnute i izračunat procentualniudio svake od njih po godinama. Rezultati su prikazani u obliku grafikona za svaku godinu pojedinačno, kao i za period od šest godina. Najviše su pogođeni zdravstvo, organi uprave i obrazovanje. Također su analizirane pojave različitih sojeva ransomware-a tokom godina, kao i odgovarajući trendovi učestalosti. Iako se ne mogu uočiti pravilnosti, moguće je formirati trendove broja evidentiranih sojeva. Rezultati ove studije daju osnovu za buduća predviđanja broja ransomware napada i broja sojeva.

Keywords: *linija trenda,modeliranje,cyber-napad, subindustrija, ransomware soj.*

INTEGRATED IT SYSTEMS FOR THE MANAGEMENT OF ACTIVITIES RELATED TO BORDER CONTROL AT THE SCHENGEN SPACE

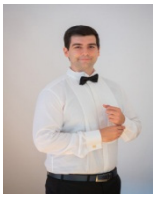
Petrică Tertereanu[1], Aurel Mihail Țițu[2, 3], Adrian Bogorin-Predescu[4], Vasile Gusan[5], Daniel Bâlc[6], Alina Bianca Pop[7]
[1,4,5,6]National University of Science and Technology POLITEHNICA Bucharest, Faculty of Industrial Engineering and Robotics, Bucharest, Romania
[2]Lucian Blaga University of Sibiu, Sibiu, Romania
[3]The Academy of Romanian Scientists, Bucharest, Romania
[7]Technical University of Cluj-Napoca, North University Center of Baia Mare, Romania


Petrică Tertereanu


Aurel Mihail Țițu


Adrian Bogorin-Predescu


Vasile Gusan


Daniel Bâlc


Alina Bianca Pop

ABSTRACT:
Human civilization has created the biggest project, namely the Internet, the modern information society is already a reality. Currently, solutions are being sought internationally to save resources, migrate to collaborative unified communications solutions and expand open-source Web applications. At the current level of the society in which we live, as well as most lines of work are dependent on voice, video and data communications, which represent the fulfilment of daily work duties. This scientific paper, it is presented how to manage the activities related to integrated border management in the Schengen Area. Analysis of known physical characteristics to confirm government authorities have used a person's identity for more than 100 years. We will also analyse the development of biometric technologies in terms of integrating them into modern border control procedures.

Keywords: *information system, biometric technology, Schengen area, Schengen Information System, digital photography*

THE IMPACT OF SMES INTEGRATION ON THE POWER GRID: CURRENT TOPOLOGIES AND NONLINEAR CONTROL STRATEGIES

Mohamed Khaleel[1], Ozan Gulbudak[1], Sadoon K. Ayed[2], Mustafa A.S. Mustafa[3], Hasan Shakir Majdi[4], Laith Jaafer Habeeb[5], Monaem Elmnifi[6]

[1]Department of Electrical-Electronics Engineering, Karabuk University, Karabuk, Turkey
[2]Collige of technical engineering, University of Albayan, Baghdad, Iraq
[3]Department of Refrigeration and Air Conditioning Engineering, Al-Rafidain University College, Baghdad, Iraq
[4]Hasan Shakir Majdi, Department of Chemical Engineering and Petroleum Industries, Al-Mustaqbal University College, Hillah, Babylon, Iraq
[5]Training and Workshop Center, University of Technology- Iraq, Baghdad, Iraq
[6]Department of Mechanical Engineering, Bright Star University, Brega, Libya


Mohamed Khaleel


Ozan Gulbudak


Sadoon K. Ayed


Mustafa A.S. Mustafa


Hasan Shakir Majdi


Laith Jaafer Habeeb

ABSTRACT:
Superconducting magnetic energy Storage (SMES) has recently provided fast and effective relief on the power grid (PG). In addition to that, the power quality (PQ) issues affecting the PG continue to receive special attention. There is no doubt that the PQ issues are an important point concerning the effect on the power grid (PG) utility. In this context, this manuscript aims to demonstrate in-depth the configurations, characterization, and properties of SMES as a robust energy storage (ES) technology. The main objective of SMES can be achieved by delivering excellent performance to support the demand load. From this perspective, current topologies SMES-PG interconnection are developed to evaluate the effectiveness and performance-enhancing while supplying efficient energy using non-linear control strategy including sliding mode controller strategies, partial feedback linearization, control strategy, hysteresis controller strategy, robust controller strategy, and predictive controller strategy. To conclude, this manuscript investigates in detail to determine the applications of SMES-PG interconnection and future scope.

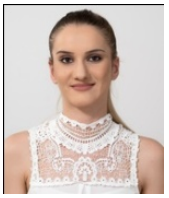
Keywords: *SMES, Power Grid, Power quality, Current Topologies, and Nonlinear Control Strategies*

PDCA CYCLE AS THE FOUNDATION OF INTEGRATED MANAGEMENT SYSTEMS WITH AN EMPHASIS ON THE ENERGY MANAGEMENT SYSTEM

PDCA CIKLUS KAO TEMELJ INTEGRIRANIH SISTEMA UPRAVLJANJA SA AKCENTOM NA SISTEM UPRAVLJANJA ENERGIJOM

Pobrić Senada[1], Gadara Merima[1], Manjgo Mersida[1]
[1]Faculty of Mechanical Engineering, "Džemal Bijedić" University of Mostar, Mostar, Bosnia and Herzegovina


Senada Pobrić


Merima Gadara


Mersida Manjgo

ABSTRACT:
Many organizations establish management systems that: improves the quality of processes and process results, improves the attitude towards the environment, improve energy performance, etc., which represents a good path towards corporate social responsibility of the organization. The methodology on which all management systems are based is unique and is represented by the PDCA cycle. The paper will highlight the importance of the aforementioned methodology for management systems, with an emphasis on the energy management system, which leads to the improvement of energy performance: energy efficiency, energy use and consumption.Using the example of the heating and cooling system for a one shopping center, through the phases of the PDCA cycle, it will be shown how much electricity savings and CO_2 emission reduction can be achieved by using a heat pump water to water.

Keywords: *PDCA cycle, energy management system, ISO 50001, energy efficiency*

REZIME:
Mnoge organizacije uspostavljaju sisteme upravljanja kojima se: poboljšava kvalitet procesa i rezultata procesa, poboljšava odnos prema okolini, poboljšavaju energetske performanse, i dr., što predstavlja dobar put ka društveno odgovornom poslovanju organizacije. Metodologija na kojoj se temelje svi sistemi upravljanja jedinstvena je i predstavljena je PDCA ciklusom. U radu će se istaknuti značaj navedene metodologije za sisteme upravljanja, sa akcentom na sistem upravljanja energijom, koja vodi poboljšanju energetskih performansi: energetske efikasnosti, korištenja i potrošnje energije. Na primjeru sistema grijanja i hlađenja jednog trgovačkog centra, kroz faze PDCA ciklusa, pokazat će se kolike se uštede u električnoj energiji, te smanjenju emisije CO_2 mogu postići primjenom toplotne pumpe voda-voda.

Ključne riječi: *PDCA ciklus, sistem upravljanja energijom, ISO 50001, energetska efikasnost*

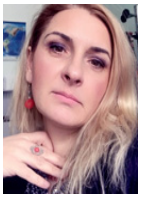
COMPARATIVE ANALYSIS OF DIFFERENT SOLAR ASSISTED DESICCANT COOLING SYSTEMS

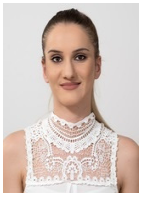
KOMPARATIVNA ANALIZA RADA RAZLIČITIH SISTEMA SOLARNOG HLAĐENJA POSTUPKOM ODVLAŽIVANJA

Haris Lulić[1], Sadjit Metović[1], Almira Softić[1], Merima Gadara[2]
[1]University of Sarajevo – Faculty of Mechanical Engineering, Sarajevo, Bosnia and Herzegovina
[2]Mašinski fakultet, Univerziteta "DžemalBijedić" u Mostaru, Mostar, Bosnia and Herzegovina


Haris Lulić


Sadjit Metović


Almira Softić


Merima Gadara

ABSTRACT:
In this work, a comparative analysis of the operation of three different models of solar cooling using a desiccant wheel with solid material filling was made. Each of the models is described in detail, schematically presented, and changes in the state of humid air are shown in the h-x diagram. The existing conventional cooling system is defined as the basic model, with the process of dehumidifying 27,600m³/h of humid air. On other models, promising improvements were made with the aim of more efficient operation of the system and increase of the total COP, as well as with the aim of using renewable energy sources. The simulation of the operation of the analyzed models was done in TRNSYS for the conditions that describe the parameters of the humid air of the existing system in the operating mode. The analysis of the results included and compared the calculated COP values, referred to the total, primary and electrical energy delivered to the system.

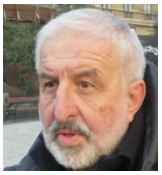
Keywords:*solar assisted desiccant cooling, TRNSYS, solid desiccant, desiccant wheel, humid air*

REZIME:
U ovom radu napravljena je komparativna analiza rada tri različita modela solarnog hlađenja korištenjem odvlaživačkog točka sa ispunom od čvrstog materijala. Svaki od modela je detaljno opisan, šematski predstavljem, te u h-x dijagramu prikazane promjene stanja vlažnog vazduha. Kao osnovni model definisan je postojeći konvencionalni sistem hlađenja, procesom odvlaživanja27600m³/h vlažnog vazduha. Na drugim modelima urađena su odovarajuća poboljšanja s ciljem efikasnijeg rada sistema i povećanja ukupnog COP-a, kao i s ciljem korištenja obnovljivih izvora energije. Simulacija rada analiziranih modela urađena je u TRNSYS-u za uslove koji opisuju parametre vlažnog vazduha postojećeg postrojenja u radnom režimu. Analizom rezultata obuhvaćene su i uporeñene izračunate vrijednosti COP-a, referirane na ukupnu, primarnu i električnu energiju isporučenu sistemu.

Ključne riječi*: Solarno hlađenje odvlaživanjem, TRNSYS, čvrsti odvlaživač, odlaživački točak, vlažan vazduh*

FRACTAL DIMENSION MEASUREMENT UNCERTAINTY
NESIGURNOST MJERENJA FRAKTALNE DIMENZIJE

Volodymyr Tonkonogyi[1], Maryna Holofieieva[1], Predrag Dašić[2,3], Sergii Klimov[1], Oleksii Buriachenko[1]
[1]Odessa National Polytechnic University (ONPU), Odessa, Ukraine
[2]Engineering Academy of Serbia (IAS), Belgrade, Serbia
[3]SaTCIP Publisher Ltd., Vrnjačka Banja, Serbia


Volodymyr Tonkonogyi


Maryna Holofieieva


Predrag Dašić


Sergii Klimov


Oleksii Buriachenko

ABSTRACT:
When designing complex systems, the problem of optimization is particularly relevant, that boils down to the solution of many inverse problems on the way to creating models of the future object and its tests. The using of complex objects in automatic design systems, which contain elements that jointly solve some general task of standard inverse calculation from the required properties of the system to the parameters of the design or manufacturing technology, is also complicated. During such calculations, a significant simplification of the used models can be achieved by using the fractal dimension of individual system elements. The principle of hierarchical organization of fractal-type models, in which it is possible to ascertain the independence of object properties from the scale, i.e. the spread of the results of the research of the properties of one of the dimensional levels to other scale levels, often occurs in nature and is certainly manifested in material structures and ... The article is devoted to the development of a method for calculating the uncertainty of fractal dimension measurement, which would fully characterize the measurement result.

Keywords*: fractal, fractal dimension, measurement accuracy, measurement uncertainty.*

REZIME:
Prilikom projektovanja složenih sistema posebno je aktuelan problem optimizacije, koji se svodi na rešavanje mnogih inverznih problema na putu kreiranja modela budućeg objekta i njegovih testova. Komplikovano je i korišćenje složenih objekata u sistemima automatskog projektovanja, koji sadrže elemente koji zajednički rešavaju neki opšti zadatak standardnog inverznog proračuna od traženih svojstava sistema do parametara tehnologije projektovanja ili proizvodnje. Prilikom ovakvih proračuna može se postići značajno pojednostavljenje korištenih modela korištenjem fraktalne dimenzije pojedinih elemenata sistema. Princip hijerarhijske organizacije modela fraktalnog tipa, u kojem je moguće utvrditi nezavisnost svojstava objekta od skale, odnosno širenje rezultata istraživanja svojstava jednog od dimenzionalnih nivoa na druge nivoe skale, često se javlja u prirodi i svakako se očituje u materijalnim strukturama i ... Članak je posvećen razvoju metode za izračunavanje nesigurnosti mjerenja fraktalne dimenzije, koja bi u potpunosti karakterizirala rezultat mjerenja.

Ključne riječi*: fraktal, fraktalna dimenzija, tačnost mjerenja, mjerna nesigurnost.*

MOBILE APPLICATION MDATING

MOBILNA APLIKACIJA MDATING

Suad Sućeska

Suad Sućeska

ABSTRACT:
Dating applications are very much and successfully used in developed countries for getting necessary information for finding an appropriate partner. Most of these applications in developed countries get professional support, especially from sociology and psychology experts. This is the reason for the commercialization of their use. Mobile application mDating enables use of dating service in Bosnia and Herzegovina. It is made for smartphones with operating system Android.

Keywords: *finding a partner, dating service, mobile application, mDating, Android*

REZIME:
Aplikacije tipa dating se veoma mnogo i uspješno koriste u razvijenim zemljama za dobivanje potrebnih informacija za nalaženje odgovarajućeg partnera. Većina ovih aplikacija u razvijenim zemljama dobiva stručnu podršku, naročito od stručnjaka za sociologiju i psihologiju. Ovo je razlog za komercijalizacijunjihove upotrebe. Mobilna aplikacija mDating omogućava korištenje dating servisa u Bosni i Hercegovini. Napravljena je za smartphone sa operativnim sistemom Android.

Ključne riječi: *nalaženje partnera, dating servis, mobilna aplikacija, mDating, Android*

1. INTRODUCTION

In developed countries, dating applications are much and successfully used for getting necessary information for finding an appropriate partner [11, 12]. Dating services are very useful for the fast pace of modern life. To achieve the quality of services, most of these applications in developed countries get professional support, especially from experts in sociology and psychology, but also from other collaborators. It is the reason why usage of these applications is not for free. Mobile application mDating enables free use of dating service exclusively in the territory of Bosnia and Herzegovina.

INTELLIGENT TRAFFIC SAFETY MANAGEMENT ON A SECTION OF A MULTI-LANE MOTORWAY

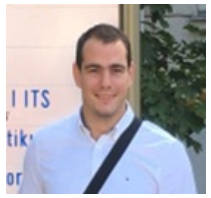
INTELIGENTNO UPRAVLJANJE SIGURNOŠĆU PROMETA NA DIONICI VIŠETRAČNE AUTOCESTE

Sadko Mandžuka[1], Krešimir Vidović[2], Goran Kos[3], Luka Dedić[4]
[1]Faculty of Traffic and Transport Sciences, Zagreb, Croatia
[2]Ericsson Nikola Tesla, Zagreb, Croatia
[3]Institut for Tourism, Zagreb, Croatia
[4]PROMETIS ltd., Zagreb, Croatia


Sadko Mandžuka


Krešimir Vidović


Goran Kos


Luka Dedić

ABSTRACT:
The paper describes model of intelligent traffic safety management on a section of a multi-lane motorway. System is based on estimation accident risk that uses real-time data of traffic flow on motorway section. Advanced system for giving warning messages to drivers will be analyzed, too. As one of the examples, it is described warning system when the use of mobile devices by the driver is detected.

Keywords*: intelligent transport system, multi-lane motorway, road safety, traffic micro-simulation, warning system*

REZIME:
U radu je opisan model inteligentnog upravljanja sigurnošću prometa na dionici višetračne autoceste. Sustav se temelji na procjeni rizika od nezgoda koja koristi podatke o prometu na dionici autoceste u stvarnom vremenu. Analizira se i napredni sustav za davanje poruka upozorenja vozačima. Kao jedan od primjera opisan je sustav upozorenja kada se detektira korištenje mobilnih uređaja od strane vozača.

Ključne riječi: *inteligentni transportni sustavi, višetračna autocesta, cestovna sigurnost, mikro simulacije, sustav upozorenja.*

A SYSTEMATIC LITERATURE REVIEW OF THE URBAN AIR MOBILITY SYSTEMS THAT ARE REVOLUTIONIZING THE URBAN TRANSPORT

Carlos Pérez Carrera[1], Ömer Ekim Genel[2], Maria Curcio[3], Carmine Maria Pappalardo[4], Domenico Guida[5]
[1,3,4,5] University of Salerno, Fisciano, Italy
[2] Istanbul Technical University, Istanbul, Türkiye


Carlos Pérez Carrera


Ömer Ekim Genel


Maria Curcio


Carmine Maria Pappalardo


Domenico Guida

ABSTRACT:
Urban Air Mobility (UAM)revolutionises urban transportation by integrating aerial vehicles. It encompasses electric aircraft, drones, and autonomous systems, and addresses traffic challenges. This analysis contextualises the evolution of UAM, drawing on pioneering studies. A systematic literature review, using the Web of Science database, reveals that UAM publications have increased, mainly from the United States. Key areas of focus within this field include vehicle design, energy management, and social impact, whereas the areas of optimisation and simulation exhibit comparatively less development. Results from the multiple correspondence analysis reveal three domains: technology and development, implementation and social acceptance, as well as safety and legal aspects. The broad scope of this analysis aids in understanding the transformative dynamics of urban mobility.

Keywords: *urban air mobility, air transport, bibliometric analysis, literature review, thematic clusters, multiple correspondence analysis, transport technology*

1. INTRODUCTION

Urban air mobility has the potential to revolutionise urban transport by introducing aerial vehicles into city environments. This exciting field has gained considerable attention due to its ability to provide innovative solutions to the problems of traffic and congestion in urbanised regions [1-4]. UAM encompasses an array of technologies, such as electric aircraft, drones, and autonomous air transport systems [5-7]. The progress of UAM has been spurred by advancements in aerospace technology, aircraft electrification, and the increased attention from regulators and industry [8-11]. In this ever-changing environment, it is important to perform systematic reviews of the literature to gain a complete understanding of the technological developments, regulatory hurdles, and social and economic effects, as well as what lies ahead for this field [12-14]. Innovative research, exemplified by Garrow et al.'s study, ...

USING SMART SOLUTIONS FOR CREATING THE MODEL OF URBAN SUSTAINABLE MOBILITY

PRIMJENA PAMETNIH RJEŠENJA U KREIRANJU MODELA URBANE ODŽIVE MOBILNOSTI

Arnela Mujić[1], Edin Gadžo[2], Osman Lindov[3]
[1]Rock and Log d.o.o., Zenica, Bosnia and Herzegovina
[2]PC Highways FB&H, Sarajevo, Bosnia and Herzegovina
[3]University of Sarajevo, Faculty of Traffic and Communications, Sarajevo, Bosnia and Herzegovina


Arnela Mujić


Edin Gadžo


Osman Lindov

ABSTRACT:
Traffic with its negative effect significantly affects sustainability and mobility in urban environments. The streets in the cities and towns could become destinations worthy of a visit, designed as great avenues for walks, children's area, bicycle and scooter lanes, and not only transit routes. Motor vehicles must and should have their place when satisfying the need for mobility in urban environments which is inevitable, but priority in spatial planning should be focused on giving advantage to pedestrian and bicycle traffic, other alternative forms of transport, and public transport. This paper aims to analyse the use of smart solutions for establishing a standardized framework for the implantation of the sustainable mobility concept in urban environments with similar features.

Keywords:*mobility, sustainable, technology, urban areas*

REZIME:
Saobraćaj svojim negativnim uticajima u značajnoj mjeri utiče na održivost i mobilnost u urbanim sredinama. Ulice u gradovima i naseljima mogu postati destinacije vrijedne posjete, dizajnirane kao veliki bulevari, namijenjeni za šetnju, igru djece, vožnju bicikla ili romobila – a ne samo tranzitne saobraćajnice. Motorna vozila trebaju i moraju imati svoje mjesto u zadovoljenju potreba za mobilnošću u urbanim sredinama, što je neizbježno, ali prioritet prilikom planiranja prostora i davanja prednosti u odnosu na motorna vozila treba da bude usmjeren ka pješačkom i biciklističkom saobraćaju, drugim alternativnim vidovima prevoza, te javnom gradskom prevozu. Svrha ovog rada bit će analiziranje primjene pametnih rješenja kako bi se uspostavio standardizovani okvir za implementaciju koncepta održive mobilnosti u urbanim sredinama sličnih karakteristika.

Ključne riječi: *mobilnost, održivost, tehnologija, urbane sredine.*

GLOBAL ELECTRIC CAR MARKET

***Branislav Dudić*[1]**
[1]*Comenius University Bratislava, Faculty of Management, Bratislava, Slovakia*

Branislav Dudić

ABSTRACT:
The world must consider the challenge of innovation in automotive industry because of keeping its position on the market and improving economic situation. Nowadays, automobile producers all around the world invest massively into the development of electric drive of automobiles-electro mobiles. Development of electromobility should bring the creation of new work positions in economy. Statistics show that electric cars will increase their numbers on roads every year till they reach their maximum and will not be the part of combustion engine. Electric cars should be able to substitute gradually cars with conventional combustion engines. Electromobility is becoming an everyday part of people's lives. The number of electric cars is still growing all over the world. Nowadays, electro mobiles are more competitive, endurance distance is longer, there are efforts to unify charging technologies and charging infrastructure is gradually developing in every country. Every state has established its direct and indirect support of electromobility whereby countries all around the world have created the conditions for the market growth of electric automobiles.

Keywords: *electromobility, environment, global market, electric vehicle production.*

1. INTRODUCTION

Transport is the part of our everyday life. Cars, buses, planes, ships, trains and other means of transport enable us to overcome different distances, either in a particular state or in international transport. High air pollution is caused mainly by transport [1], and vehicle exhaust gas emissions have a significant negative impact on global warming [2]. Electric vehicles don't have internal combustion engines, which means they don't have hundreds of different parts that go into the engine [3]. There is no engine oil in electric vehicles, so there is no risk of spillage and pollution of land or water [4].
Development of electromobility as the new and innovative way of transport should bring the decrease of emissions or make it disappear completely. The main characteristics of electric vehicles are that they do not pollute the environment, smooth driving, silent operation, a pleasant driving experience, etc. [5]. The expression electromobility is connected to the expression electro mobile what is represented by a type of transport powered by electric engine. It has to be mentioned that electric vehicle need not necessary be always introduced as an automobile [6]. Electromobility slowly becomes everyday part of people´s lives.

ANALYSIS OF OPPORTUNITIES OF SOFTWARE FOR OPTIMIZATION OF TRANSPORT ROUTES

ANALIZA MOGUĆNOSTI SOFTVERA ZA OPTIMIZACIJU TRANSPORTNIH RUTA

Maida Eljazović[1], Drago Ezgeta[2], Nedim Kamenjašević[3], Mirzet Sarajlić[4]
[1]Nelt Ltd., East Sarajevo, B&H
[1,2]University of Sarajevo, Faculty of Traffic andCommunications, Sarajevo, B&H
[3]Cantonal Administration for Inspection Issues Canton Sarajevo, B&H
[4]Ministry of Traffic Canton Sarajevo, B&H


Maida Eljazović


Drago Ezgeta


Nedim Kamenjašević


Mirzet Sarajlić

ABSTRACT:
Logistic processes supported by intelligent transport systems enable real-time monitoring and optimization of the transport process in the phase of delivery of shipments tousers. Monitoring of all operations of the carrier's fleet is necessary due to the insight into the performed operations, where precise data enables and facilitates the adoption of correct business decisions by all actors of the transport chain.
This paper analyzes software for optimizing delivery routes, which is reflected in the possibility of reducing the number of kilometers traveled, the possibility of saving fuel consumption and optimizing the working time of drivers and logistics operators. The intelligent system is based on machine learning methods, but in this paper we deal with the advantages and disadvantages of the system solution. The paper also contains suggestions that would improve system solutions by applying machine learning.

Keywords: *route optimization, transport, intelligent systems, delivery vehicles.*

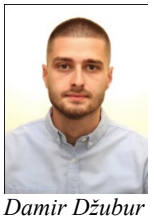
REZIME:
Logistički procesi podržani inteligentnim transportnim sistemima omogućavaju stvarnovremensko praćenje i optimizaciju procesa transporta u fazi dostave pošiljaka krajnjim korisnicima. Praćenje svih operacija flote prevoznika je potrebno zbog uvida u izvršene operacije, gdje precizni podaci, svim akterima transportnog lanca omogućuju i olakšavaju donošenja ispravne poslovne odluke.
U ovom radu je analiziran softwer za optimizaciju dostavnih ruta, koji se ogleda u mogućnosti smanjenja broja pređenih kilometara, mogućnosti uštede u potrošnji goriva i optimizaciji vremena rada vozača i logističkih operatera. Inteligentni sistem je baziran na metodama mašinskog učenja ali se u ovom radu bavimo prednostima i nedostacima sistemskog rješenja. Takođe u radu su dati prijedlozi koji bi primjenom mašinskog učenja unaprijedili sistemska rješenja.

Ključne riječi: *optimizacijaruta, transport, inteligentnisistemi, dostavnavozola.*

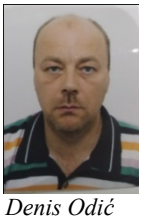
THE POSSIBILITY OF IMPLEMENTING THE A-CDM CONCEPT AT SMALLER AIRPORTS UP TO 2 MILLION PASSENGERS

MOGUĆNOST IMPLEMENTACIJE A-CDM KONCEPTA NA MALIM AERODROMIMA DO DVA MILIONA PUTNIKA

Damir Džubur[1], Muharem Šabić[1], Denis Odić[1]
[1]*University of Sarajevo, Faculty of Traffic and Communications, Sarajevo, Bosnia and Herzegovina,*


Damir Džubur


Muharem Šabić


Denis Odić

ABSTRACT:
Airport Collaborative Decision Making, Airport CDM or A-CDM in short is a concept being deployed at airports, which delivers operational efficiency and resilience improvements by improving the predictability of events during the progress of a flight and optimising the utilisation of resources and infrastructure.When implemented successfully, A-CDM facilitates improved collaboration between the typical A-CDM partners (airport operators, ATC units, aircraft operators and ground handlers) for optimal decision making by factoring in their priorities, preferences and constraints, for the actual and predicted situation. Originally focusing on large hubs, the adoption of A-CDM principles is getting more traction at smaller and regional airports as they see the benefits of thorough stakeholder collaboration. In this paper we will analyze the possibility of implementing the A-CDM concept at smaller airports up to 2 milion passengers

Keywords: *A-CDM, performance based airport operations, key concept elements, small airports, milestone approach, objectives, system and process gaps*

REZIME:
Zajedničko donošenje odluka na aerodromima, aerodromski CDM ili A-CDM ukratko je koncept koji se primjenjuje na aerodromima. On pruža operativnu efikasnost i otpornost,, povećanu predvidljivost događaja tokom leta i optimizirajuće korištenje resursa i infrastrukture. Kada se uspješno implementira, A-CDM olakšava saradnju između A-CDM partnera (aerodromskih operatera, ATC jedinica, operatera aviona i zemaljskih operatera) za optimalno donošenje odluka uzimajući u obzir njihove prioritete, preferencije i ograničenja, za stvarnu i predviđenu situaciju na aerodromima. Prvobitno fokusiran na velika čvorišta, usvajanjeA-CDM koncepta dobija sve veću pažnju na manjim i regionalnim aerodromima, jer i oni uviđaju prednosti ovakve saradnje između zainteresiranih strana na određenom aerodromu. U ovom radu analizirat ćemo mogućnost implementacije A-CDM koncepta na manjim aerodromima do 2 miliona putnika.

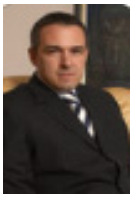
Ključne riječi: *A-CDM, aerodromske operacije zasnovane na performansama, ključni elementi koncepta, mali aerodromi, pristup implementaciji putem prekretnica,, ciljevi, sistemski i procesni nedostaci*

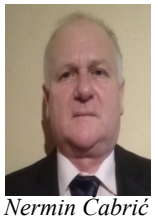
ANALYZING THE FACTORS INFLUENCING THE PERFORMANCE OF RAILWAY INFRASTRUCTURE MANAGERS

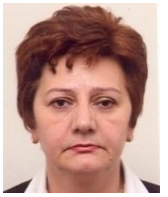
ANALIZA FAKTORA KOJI UTIČU NA PERFORMANSE UPRAVITELJA ŽELJEZNIČKE INFRASTRUKTURE

Aida Kalem, Nedžad Branković, Nermin Čabrić, Fadila Kiso
University of Sarajevo, Faculty of Traffic and Communications, Sarajevo, B&H


Aida Kalem


Nedžad Branković


Nermin Čabrić


Fadila Kiso

ABSTRACT:
Railway infrastructure managers play a vital role in the proper functioning of railway systems in various countries. Their success depends on many factors, including geographical, climatic, political, social, service-related, technological, and economic aspects. This research employs the TOPSIS method (Technique for Order of Preference by Similarity to Ideal Solution) to evaluate the performance of 19 European railway infrastructure managers. Variables used for ranking include area size, population, gross domestic product (GDP), modal share in passenger and freight transport, infrastructure management quality, active licenses, network length, and full-time employees. This approach aims to deepen the understanding of infrastructure managers performance, considering various aspects, including geographic, economic, technological, and social factors. ...
The findings of this research hold significance for advancing sustainability and efficiency within the railway sector.

Keywords: *railway infrstructure managers, key factors, performance, evaluation, TOPSIS method*

SAŽETAK:
Upravitelji željezničke infrastrukture od vitalnog su značaja za pravilno funkcioniranje željezničkih sistema u različitim zemljama. Njihova uspješnost ovisi o mnogim faktorima, uključujući geografske, klimatske, političke, društvene, uslužne, tehnološke i ekonomske aspekte. Ovaj istraživački rad koristi metodu TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) za evaluaciju performansi 19 europskih upravitelja željezničke infrastrukture. Među varijablama koje će biti korištene za rangiranje upravitelja su veličina područja, populacija, bruto domaći proizvod (BDP), modalni udio u putničkom i teretnom prometu, kvaliteta upravljanja infrastrukturom, aktivne licence, dužina mreže i zaposlenici sa punim radnim vremenom. Ovim pristupom želimo dublje razumjeti performanse upravitelja željezničke infrastrukture uzimajući u obzir različite aspekte, uključujući geografske, ekonomske, tehnološke i društvene faktore. ...
Rezultati ovog istraživanja imaju značaj za unaprijeđenje održivosti i efikasnosti u željezničkom sektoru.

Ključne riječi: *upravitelji željezničke infrastrukture, ključni faktori, performanse, evaluacija, TOPSIS metoda.*

A DEEP LEARNING APROACH FOR TRAFFIC FLOW PREDICTION IN CITY OF SARAJEVO

PRIMJENA DUBOKOG UČENJA ZA PREDVIĐANJE SAOBRAĆAJNOG TOKA U GRADU SARAJEVU

Nedim Kamenjašević[1], Maida Eljazović[2], Mirzet Sarajlić[3],
[1]Cantonal Administration for Inspection Issues Canton Sarajevo, Sarajevo, Bosnia and Herzegovina
[2]Nelt Ltd, East Sarajevo, Bosnia and Herzegovina
[3]University of Sarajevo, Faculty of Traffic and Communications, Sarajevo, Bosnia and Herzegovina


Nedim Kamenjašević


Maida Eljazović


Mirzet Sarajlić

ABSTRACT:
Constant traffic jams and congestion in the City of Sarajevo reduce the efficiency of the traffic infrastructure and increase travel time and air pollution. In order to achieve the required level of service of the road network, as well as to increase traffic safety, and at the same time reduce air pollution, it is necessary to approach short-term traffic flow planning in the City of Sarajevo. Deep learning techniques can be used with technological progress to collect information from real time and to predict future traffic flow in the City of Sarajevo.

Keywords: *traffic jams, traffic congestions, traffic flow, deep learning*

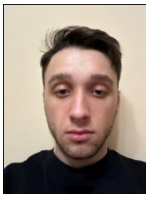
REZIME:
Stalne saobraćajne gužve i zagušenja u Gradu Sarajevu smanjuju efikasnost saobraćajne infrastrukture i povećavaju vrijeme putovanja i zagađenje zraka. Kako bi se postigao potreban nivo usluge cestovne mreže, kao i da bi se povećala sigurnost saobraćaja, i smanjilo zagađenje zraka, potreban je pristup kratkoročnom planiranju saobraćajnih tokova u Gradu Sarajevu. Tehnike dubokog učenja mogu se koristiti s tehnološkim napretkom kako bi se prikupile informacije u stvarnom vremenu i predvidio budući saobraćajni tok u Gradu Sarajevu.

Ključne riječi: *saobraćajne gužve, saobraćajna zagušenja, saobraćajni tok, duboko učenje*

TECHNOLOGICAL INHERITABILITY OF PARAMETERS OF SURFACE ENGINEERING OF PRODUCTS AFTER VIBRATIONAL-CENTRIFUGAL HARDENING

Yaroslav Kusyi[1],AndriiKuk[2], Ivan Klymash[3], Nazarii Kusen[4], Victor Vriukalo[5]
[1,2,3 4]LvivPolytechnic National University, Lviv, Ukraine
[5]Ivano-Frankivsk National Technical University of Oil and Gas, Ivano-Frankivsk,Ukraine




Yaroslav Kusyi *Andrii Kuk* *Ivan Klymash* *Nazarii Kusen* *Victor Vriukalo*

ABSTRACT:
Modern technologies of products manufacturing are identical to the processes of transformation (technological inheritability) and preservation (technological heredity) of properties of mechanical engineering objects under the appropriate influences of the elements of the certain technological media: metal-cutting machine – clamping device – metal-cutting tool (s). The characteristics of the machined material and the parameters of surface engineering as carriers of inherited information are transformed under the influence of dominant technological factors during the performance of technological operations, technological steps, etc. In this paper, the technological inheritability of surface engineering parameters is investigated after passing the "technological barrier" – surface plastic deformation of the cylinder bushings of drilling pumps at the final operation of their manufacture. Improvement of microrelief parameters of executive internal cylindrical surfaces of bushings operating under conditions of intense abrasive wear, is ensured by replacing traditional abrasive machining with vibrational-centrifugal hardening, implemented on vibrational machine of volumetric machining. Step-by-step machining using vibrational treatment by means of deformable bodies of two standard sizes – steel balls ∅ 10 mm, ∅ 8.5 mm, cleaning using uralite and modification of the inner surface using hard alloy DIN (WNr, HG30, HG40) improves the high-altitude roughness parameters (Ra, Rz, Rq, Rp) by 4.9-9.2 times compared to the corresponding values after finish turning. At the same time, the value of relative profile reference length tp increases from 0.5222 (after final turning) to 0.7486 (after the last technological step of the final technological operation) which ensures the formation of a wear-resistant operational relief.

Keywords: *technological process, technological inheritability, functionally-oriented technology, vibrational-centrifugal hardening, roughness*

TOWARD COMPLETE DIGITALISATION OF POSTAL ITEMS CLEARANCE IN THE REPUBLIC OF CROATIA

Kljak Tomislav[1], Binički Marijan[2], Škorput Pero[1], Vrkić Domagoj[3]
[1]The University of Zagreb, The Faculty of Transport and Traffic Sciences, Zagreb, Croatia
[2]The Croatian Post, Zagreb, Croatia
[3]student at The University of Zagreb, The Faculty of Transport and Traffic Sciences, Zagreb, Croatia

Pero Škorput

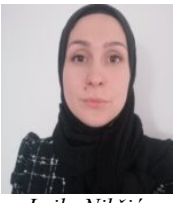
Domagoj Vrkić

ABSTRACT:
The initial idea of this paper is determining the need and possibilities of the complete digitalisation of postalitems clearance (collection, acceptance, receiving, reception phase). Although many postal service providers have already digitalised a significant portion of their technological processes, including the clearance of postal items, it hasn't been completed yet. There are certain situations that require traditional manual completion of requests/data for sending postal items. This unnecessarily burdens collection capacities, increases the time needed forproviding postal service (although it is being measured only after the collection of the postal item), what proportionally affects the quality of service and customer satisfaction, regardless objectively the measured or "only" the subjectively experienced. Significant differences exist among postal service providers, depending on the type of users and the type of postal items/services. The paper analyses relevant examples for the situation in the Republic of Croatia. The achieved level of digitalisation, not only in the society as a whole but among almost all postal service providers as well, represents a solid foundation for extending this approach to the remaining part of the postal items collection. In addition to reducing the negative effects, such efforts would enable potentials for further automation of postal processes, standardisation of procedures, and sharing of certain network resources by multiple postal operators, bringing various benefits to both users and postal service providers as well.

Keywords: *Postal traffic, digitalisation, quality of service.*

AIR TRAFFIC FLOW ANALYSIS OF FIR SARAJEVO
ANALIZA PROTOKA ZRAČNOG SAOBRAĆAJA KROZ FIR SARAJEVO

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



Lejla Nikšić

ABSTRACT:
The aim of this study is to find capacity of airspace of Bosnia and Herzegovina. Airspace of Bosnia and Herzegovina is described in this research; hence flight data for year 2013 are analyzed. In this research we analyzed flights according to aircraft categories and entry and exit points of Sarajevo FIR. Analyzing flight data together with distribution of air traffic according to months, days and hours, also, peak day and peak hour has been found. Model of airspace of Bosnia and Herzegovina has been made in SIMMOD program with several different scenarios in which numbers of flights have been changed, as experimental values. Four different scenarios have been evaluated, for this part of airspace with these numbers of flights: 26, 60, 80 and 100 per hour. With these analysis and experiments delay time has been set and conclusion has been made describing why these delays occur, as well as capacity of this airspace. Structure of airspace of Bosnia and Herzegovina is capable to offer air traffic services for this part of airspace, which is presented as a conclusion of this research.

Keywords: *airspace, SIMMOD, capacity, Bosnia and Herzegovina, FIR Sarajevo*

REZIME:
Cilj ove studije je pronaći kapacitet zračnog prostora Bosne i Hercegovine. Zračni prostor Bosne i Hercegovine je opisan u ovom istraživanju; potom su analizirani podaci o letovima za 2013. godinu. Analiza letova je urađen prema kategorijama zrakoplova i ulaznim i izlaznim tačkama FIR-a Sarajevo. Analizirajući podatke o letovima zajedno sa distribucijom zračnog saobraćaja po mjesecima, danima i satima, pronađeni su i vršni dan i vršni sat. Model zračnog prostora Bosne i Hercegovine izrađen je u SIMMOD programu sa nekoliko različitih scenarija u kojima su mijenjani brojevi letova, kao eksperimentalne vrijednosti. Promatrana su četiri različita scenarija za ovaj dio zračnog prostora sa sljedećim vrijednostima: 26, 60, 80 i 100 letova/sat. Statistička analiza i model FIR Sarajeva u SIMMOD progamu je omogućio proračun kako kapaciteta FIR Sarajevo, tako i kašnjena letova u ovom zračnom prostoru, te su dati zaključci povodom ove dvije stavke. Struktura zračnog prostora Bosne i Hercegovine je u stanju ponuditi usluge zračnog saobraćaja za ovaj dio zračnog prostora, što je prikazano kao zaključak ovog istraživanja.

Ključne riječi: *zračni prostor, SIMMOS, kapacitet, Bosna i Hercegovina, FIR Sarajevo*

BARRIERS TO SMART MOBILITY IMPLEMENTATION IN URBAN CONTEXT

PREPREKE KOD IMPLEMENTACIJE PAMETNE MOBILNOSTI U URBANOM KONTEKSTU

Bia Mandžuka[1], Krešimir Vidović[2], Pero Škorput[1]
[1]*University of Zagreb, Faculty of Transport and Traffic Sciences, Zagreb, Croatia*
[2]*Ericsson Nikola Tesla, Zagreb, Croatia*


Bia Mandžuka


Krešimir Vidović


Pero Škorput

ABSTRACT:
This paper thoroughly explores and identifies the existing barriers and challenges of urban mobility (especially multimodal mobility), including issues such as the integration of diverse travel modes (interoperability, coordination), technological barriers (data openness problems), the user (passenger) experiencerelated to informational support system sinplanning multimodal journeys (Multimodal Journey Planners - MJPs), sustainability and ecological efficiency, critical segments of multimodal routes (e.g., transitioning to other modes of travel), legal and regulatory obstacles, as well as economic and social aspects. The paper conducts an analysis of best practice examples of multimodal passenger systems, offering practical insights for tackling the identified challenges. Finally, the paper presents recommendation for ongoing research and development in smart urban mobility, tailored to the evolving needs and affinities of today's travelers.

Keywords: *smart urban mobility, multimodal mobility, barriers, user experience, sustainability*

REZIME:
Ovaj rad temeljito istražuje i identificira postojeće prepreke i izazove u urbanoj mobilnosti (posebno multimodalnoj mobilnosti), uključujući pitanja kao što su integracija različitih načina putovanja (interoperabilnost, koordinacija), tehnološke prepreke (problemi s otvorenošću podataka), korisničko iskustvo putnika u vezi s informacijskim sustavima podrške pri planiranju multimodalnih putovanja (npr. multimodalni putni planeri), održivost i ekološka učinkovitost, ključni segmenti multimodalnih ruta (npr. prijelaz na druge načine putovanja, problem prvog i zadnjeg kilometra), kao i ekonomske i socijalne aspekte. U radu se provodi analiza primjera najboljih praksi multimodalnih putničkih sustava, pružajućipraktične smjernice za rješavanje prepoznatih izazova. Na kraju, rad nudi preporuke za kontinuirano istraživanje i razvoj u području pametne urbane mobilnosti, prilagođene mijenjajućim potrebama i afinitetima suvremenih putnika.

Ključne riječi: *pametna urbana mobilnost, multimodalna mobilnost, prepreke, korisničko iskustvo, održivost*

USING MACHINE LEARNING TO PREDICT ADDITIONAL TAXI-OUT TIME AS A AIRPORT KEY PERFORMANCE INDICATOR IN THE EUROCONTROL ZONE

Edvin Šimić[1], Muhamed Begović[1], Muharem Šabić[1], Ermin Muharemović[1]
[1]University of Sarajevo, Faculty of Traffic and Communications,
Sarajevo, Bosnia and Herzegovina


Edvin Šimić


Muhamed Begović


Muharem Šabić


Ermin Muharemović

ABSTRACT:
The need to expand the air transport system capacity has increased rapidly in the last few years. European airports are located in urban areas and have limited opportunities for expansion. In addition, there is high pressure on air traffic and is associated with reducing the negative impact on the environment. Therefore, it is important to optimize and transform the system from what already exists into a more efficient and greener one. This paper will evaluate how to use machine learning methods to predict a key performance indicator for airside operation, taxi-out time. Statistical correlation methods will be used to establish the dependence between attributes and the output variable. This will help decision-makers with airport optimization measures and ease the decision-making process at the macroscale level.

Keywords: *Pearson correlation, airport, capacity, prediction, taxi-out time*

1. INTRODUCTION

In the field of transportation, AI and machine learning methods are already widely utilized. Aviation is also keeping pace with other branches of transportation. The foundation for employing machine learning methods lies in extensive databases, which have become more accurate and larger in recent years. Various aviation organizations, such as Eurocontrol, are providers of this data[12]. In this paper, we will focus on European airports. The main areas for improvement are safety, capacity, cost of the service, efficiency, and the environment.Due to the increasing demand for air traffic, there is a need for the rapid implementation of new technologies, such as navigation and surveillance based on GNSS (Global Navigation Satellite System). Delays and inefficiencies in the air traffic system are difficult to predict due to a large number of entities involved and the dynamic environment in which air operations are conducted. Airline Service Quality Performance (ASQP) reported that in 2011, about 17% of all flight time was spent taxing on the ground [6]. Therefore, it is very important to work on prediction systems for such adverse events. Recently, machine learning algorithms for prediction have been increasingly used in various fields. One of the most important information for collaborative decision-making is the prediction time of different flight phases (actual off-block time, actual take-off time, landing time, etc.).

INTELLIGENT VEHICLE FUNCTIONS IN REDUCING THE UNCERTAINTY OF THE DRIVER'S ENVIRONMENT AND REDUCING RISK

FUNKCIJE INTELIGENTNOG VOZILA U SMANJENJU NEODREĐENOSTI OKRUŽENJA VOZAČA I SMANJENJU RIZIKA

***Drago Ezgeta*[1], *Mustafa Mehanović*[1], *Samir Čaušević*[1]**
[1]*Faculty of Traffic and Communications, University of Sarajevo, Sarajevo, Bosnia and Herzegovina*


Drago Ezgeta


Mustafa Mehanović


Samir Čaušević

ABSTRACT:
Driving a road vehicle is a complex process that requires specific knowledge and skills of the driver in order to interact with the vehicle, road infrastructure and environment. In order for the driver to make correct and timely decisions while driving, he must have a sufficient amount of information that corresponds to the current situation and the context of the driver's environment in which decisions are made. The road transport system is a dynamically open system whose state changes under the influence of random events that generate a certain degree of uncertainty in the system. Due to the lack of sufficient amount of information or due to the short time to make decisions while driving, drivers need intelligent vehicle support systems in the decision-making process. Intelligent vehicles collect data from the environment of the vehicle and the driver and provide the driver with the necessary information in order to reduce the uncertainty of his environment and support him in the execution of control functions. This paper describes the possibilities of reducing the uncertainty of the driver's environment with intelligent vehicle functions that should be adapted to the individual requirements of the driver and the context of the traffic situation, ...
Keywords: Keywords: *uncertainty, driver's environment, information, intelligent vehicle*

REZIME:
Upravljanje cestovnim vozilom složen je proces koji zahtijeva specifična znanja i vještine vozača u interakciji s vozilom, cestovnom infrastrukturom i okolišem. Kako bi vozač tijekom vožnje donosio ispravne i pravovremene odluke, mora imati dovoljnu količinu informacija koje odgovaraju trenutnoj situaciji i kontekstu vozačeve okoline u kojoj se odluke donose. Sustav cestovnog prometa je dinamički otvoren sustav čije se stanje mijenja pod utjecajem slučajnih događaja koji generiraju određeni stupanj nesigurnosti u sustavu. Zbog nedostatka dovoljne količine informacija ili zbog kratkog vremena za donošenje odluka tijekom vožnje, vozačima su potrebni inteligentni sustavi podrške vozilima u procesu donošenja odluka. Inteligentna vozila prikupljaju podatke iz okoline vozila i vozača te vozaču daju potrebne informacije kako bi se smanjila nesigurnost njegove okoline i podržala ga u izvršavanju upravljačkih funkcija. U ovom radu opisane su mogućnosti smanjenja neizvjesnosti vozačeve okoline inteligentnim funkcijama vozila koje treba prilagoditi individualnim zahtjevima vozača i kontekstu prometne situacije, ...
Ključne riječi: *neizvjesnost, okruženje vozača, informacije, inteligentno vozilo*

AGV-BASED PRODUCTION LINE FOR MORE INTELLIGENT AND FLEXIBLE MANUFACTURING IN THE TEXTILE INDUSTRY

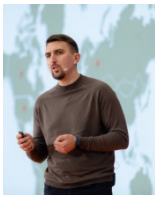
PROIZVODNA LINIJA NA BAZI AGV-a ZA INTELIGENTNIJU I FLEKSIBILNIJU PROIZVODNJU U TEKSTILNOJ INDUSTRIJI

Marinko Maslarić[1], Sanja Bojić[2], Vladimir Todorović[3], Dejan Mirčetić[4], Svetlana Nikoličić[1]
[1]Department of Traffic Engineering, Faculty of Technical Sciences,
University of Novi Sad, Novi Sad, Serbia
[2]Department of Mechanization and Design Engineering, Faculty of Technical Sciences,
University of Novi Sad, Novi Sad, Serbia
[3]Science and Technology Park Novi Sad, Novi Sad, Serbia
[4]Institute for Artificial Intelligence Research and Development of Serbia, Sad, Serbia


Marinko Maslarić


Sanja Bojić


Vladimir Todorović


Dejan Mirčetić


Svetlana Nikoličić

ABSTRACT:
New-age technologies like autonomous guided vehicles (AGVs) and the Internet of Things (IoT), combined with cutting-edge production planning concepts and software, are progressively transforming traditional production systems. However, there is a notable absence of empirical studies that consolidate and assess the impact of these disruptive technologies and software on existing manufacturing systems. This research delves into the repercussions of integrating AGVs, Radio Frequency Identification (RFID) systems, and Manufacturing Execution Systems (MES) to establish flexible and lean manufacturing systems, using a case study to demonstrate their implementation in a textile company.

Keywords:*AGVs, RFID, MES, flexible manufacturing, intelligent, lean.*

REZIME:
Tehnologije novog doba kao što su autonomna vođena vozila (AGV) i Internet stvari (IoT), u kombinaciji sa najsavremenijim konceptima i softverima za planiranja proizvodnje, progresivno transformišu tradicionalne proizvodne sisteme. Međutim, primetan je nedostatak empirijskih studija koje konsoliduju i procenjuju uticaj ovih disruptivnih tehnologija i softvera na postojeće proizvodne sisteme. Ovo istraživanje se bavi posledicama integracije AGV-a, sistema radiofrekventne identifikacije (RFID) i sistema za planiranje i izvršenje proizvodnje (MES) u cilju uspostavljanja fleksibilnih i vitkih proizvodnih sistema, koristeći studiju slučaja koja demonstrira njihovu implementaciju u tekstilnoj kompaniji.

Ključne riječi: *AGV, RFID, MES, fleksibilna proizvodnja, inteligenti, vitki.*

KINEMATIC AND DYNAMIC ANALYSIS OF THE SUSPENSION OF A RACING CAR

Giampiero Celenta[1], Marco Claudio De Simone[2]
[1]MEID4 Academic Spin-Off of the University of Salerno, Fisciano, Italy
[2]Department of Industrial Engineering, University of Salerno, Fisciano, Italy

Giampiero Celenta

Marco Claudio De Simone

ABSTRACT:
This work aims to study the kinematic and dynamic behavior of racing vehicles participating in an inter-university competition called the SAE formula. The authors developed a multibody model by using three-dimensional CAD and Mathworks' Simscape multibody simulation environment. Such a combination of tools allows the development of detailed multibody system models to be investigated for optimizing vehicle performance. The final goal is to develop a parametrical multibody model and apply Design of Experiments techniques for studying the correlation and influence of geometrical and dynamical parameters of the push-rod suspension installed on the racing car.

Keywords: *Kinematics, Dynamics, multibody modeling, Simscape, half car model*

1. INTRODUCTION

A suspension of a vehicle is an assembly of levers and deformable elements that realize the system of constraints between the unsprung and suspended masses [1]. This system determines a specific distribution of external actions by influencing the vehicle's dynamics [2-4]. In a suspension, the linkages determine the trajectory of the wheel in its relative motion concerning the body; the spring elements provide the force necessary to support the suspended masses, and the damping part dissipates the energy associated with the dynamics of the system by canceling the relative motion of the various components in a given time interval [5]. In an independent suspension, the kinematics must constrain five of the six degrees of freedom; the degree of freedom left free must consist of translation perpendicular to the ground. Numerous are the characteristic parameters of a suspension, and it is essential to know them for a complete definition of the system's characteristics [6]. The center of instantaneous rotation is defined as the point around which the wheel hub rotates instantaneously in a given plane [7]. Finding the center of instantaneous rotation in two different orthogonal planes is possible. By composing the two-dimensional kinematics motions of the suspension ...

DESIGN OF A HELICOPTER LANDING SLED USING DOE TECHNIQUES

Salvio Veneziano[1], Marco Claudio De Simone[2]
[1]MEID4 Academic Spin-Off of the University of Salerno, Fisciano, Italy
[2]Department of Industrial Engineering, University of Salerno, Fisciano, Italy

Salvio Veneziano

Marco Claudio De Simone

ABSTRACT:
This paper illustrates the benefits of utilizing Design of Experiments (DOE) techniques in designing parts and assemblies used in challenging environments, such as the aviation industry. Specifically, this study used such a method to optimize the design of landing gear for a Robinson R22-Alpha helicopter. To do so, a physical model of the caret in Ansys and the Full Factorial statistical model defined with Minitab were used. Such analysis allowed to explore the correlation between the geometrical and physical properties by using only a few experiments and to make the design data explicit. The implementation of DOE has the potential to maximize data processing capabilities by increasing productivity in many design applications that require large amounts of information.

Keywords: *Design of experiments**,** multibody, simscape, stress energy, landing gear*

1. INTRODUCTION

Design-based optimization of experiments (DOE) is a methodology successfully applied to engineering problems [1]. The basic problem is to evaluate some process with input or test variables, called factors, and with measured output variables, called responses. If the process input variables are varied, the outputs will change, even though the variation might be due only to random or noise effects [2-4]. The criterion on which DOE is based determines which input data cause most of the variability in the output; in other words, which factors are significant [5]. One wants to maximize the amount of information obtained from a study by minimizing the amount of data to be collected, which, in this case, minimizes the number of experimental runs. The main advantage of factorial designs is that it is possible to identify iterations among independent variables in a single study instead of conducting many separate studies, each varying one factor at a time. In addition, factorial designs allow the estimation of sensitivity to each factor and combinations of two or more factors simultaneously, ...

DEVELOPMENT OF NEW SENSORS FOR USE IN SMART CLOTHING

RAZVOJ NOVIH SENZORA ZA UPOTREBU U PAMETNOJ ODJEĆI

Amra Bratovcic[1], Isak Karabegovic[2]
[1]Department of Physical Chemistry and Electrochemistry, Faculty of Technology, University of Tuzla, Tuzla, Bosnia and Herzegovina
[2]Academyof Sciences and Arts of Bosnia and Herzegovina, Sarajevo, Bosnia and Herzegovina

Amra Bratovcic

Isak Karabegovic

ABSTRACT:
In this work, the latest achievements in the application of nanotechnology in the design of smart fabrics, i.e. the use of nanomaterials for the production of nanocomposite coatings that improve the properties of textile materials, were studied. Improvement of the properties of the textile materials is related to hydrophobic (waterproof) and flame-retardant properties, antibacterial effect, ultraviolet resistant, electrically conductive, optical and other. Here we are talking about the development of new modern textiles that have embedded various sensors or some smart devices that can collect different data (body temperature, heart rate, pressure), some of them can both store and release energy. The development of such materials is widely used in the clothing industry, military defense, health care and on-body energy harnessing.

Keywords: *smart textile, sensors, conductive polymers , physiological measurements, movement monitoring*

REZIME:
U radu su proučavana najnovija dostignuća u primjeni nanotehnologije u dizajnu pametnih tkanina, odnosno primjena nanomaterijala za proizvodnju nanokompozitnih prevlaka koje poboljšavaju svojstva tekstilnih materijala.Poboljšanje svojstava tekstilnih materijala odnosi se na hidrofobna (vodootporna) i vatrootporna svojstva, antibakterijski učinak, otpornost na ultraljubičasto zračenje, električnu vodljivost, optičku i dr.Ovdje je riječ o razvoju novih modernih tekstila koji imaju ugrađene razne senzore ili neke pametne uređaje koji mogu prikupljati različite podatke (tjelesna temperatura, broj otkucaja srca, tlak), neki od njih mogu i pohranjivati i oslobađati energiju.Razvoj takvih materijala naširoko se koristi u industriji odjeće, vojnoj obrani, zdravstvu i iskorištavanju energije na tijelu.

Ključne riječi: *pametni tekstil, senzori, vodljivi polimeri, fiziološka mjerenja, praćenje kretanja.*

RIVERINE BIODIVERSITY: THREATS AND CHALLENGES OF CONSERVATION ON THE EXAMPLE OF THE UNA RIVER

RIJEČNA BIORAZNOLIKOST: PRIJETNJE I IZAZOVI OČUVANJA NA PRIMJERU RIJEKE UNE

Vildana Alibabić[1], Amarildo Mulić[2], Haris Hadžihajdarević[2]
[1]University of Bihać, Biotechnical Faculty, Bihać, Bosnia and Herzegovina
[2]Una National park, Bihać, Bosnia and Herzegovina


Vildana Alibabić


Amarildo Mulić


Haris Hadžihajdarević

ABSTRACT:
The Una National Park is one of the most important centers of biodiversity in Bosnia and Herzegovina. Due to its preserved landscape and the wild river Unait has become an attractive destination for tourists and a major driver of tourism for the region of Una Sana Canton. However, this trend has brought numerous threats, especially to water and coastal habitats. The aim of this work was to answer questions about the trends in biodiversity protection in the national park and downstream, identifying threats and future challenges. Special attention was given to researching pressures stemming from increasing tourist activities. It was determined that, beyond general economic threats, the water ecosystem is threatened by the tourism intensity, seasonality, and accommodation density on the riverbanks. The main challenges are spatial planning in the Una river's coastal zone and beyond, restricting construction until the carrying capacity of that area is defined, wherein water quality and biodiversity must limit activities on and around the water.

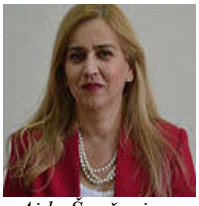
Keywords:*biodiversityconservation, river, tourism, Una National Park.*

REZIME:
Nacionalni park Una jedno je od najvažnijih središta biodiverziteta Bosne i Hercegovine. Zbog očuvanog prirodnog krajolika i divlje rijeke Une postao je privlačna destinacija turistima i glavni pokretač turizma za regiju Unsko-sanskog kantona. Međutim, taj trend donio je sa sobom brojne prijetnje, naročito za vodena i obalna staništa. Cilj ovog rada bio je odgovoriti na pitanje kakvi su trendovi zaštite biodiverziteta u nacionalnom parku i nizvodno, koje su prijetnje i šta su izazovi za budućnost. Posebna pažnja posvećena je istraživanju pritisaka koji dolaze iz rastućih turističkih aktivnosti. Utvrđeno je da pored generalnih gospodarskih prijetnji vodenom ekosistemu prijeti intenzitet turizma, sezonalnost i gustoća objekata za smještaj na obalama rijeke. Glavni izazovi su prostorno planiranje u obalnom pojasu Une i šire, zabrana gradnje do definiranja nosivog kapaciteta, a kvaliteta vode i biodiverzitet moraju limitirati aktivnosti na vodi i oko vode.

Ključne riječi: *očuvanje biološke raznolikosti, rijeka, turizam, Nacionalni park Una.*

ANTIOXIDATIVE ACTIVITY OF SELECTED BOSNIAN MUSHROOMS
ANTIOKSIDATIVNA AKTIVNOST ODABRANIH BOSANSKIH GLJIVA

Aida Šapčanin[1], Ekrem Pehlić[2], Belma Pehlivanović-Kelle[1], Gordan Jančan[3]
[1]Faculty of Pharmacy, University of Sarajevo, Bosnia and Herzegovina
[2]Faculty of Health Studies, University of Bihac, Bosnia and Herzegovina
[3]Chemilab d.o.o., Ljubljana, Slovenia


Aida Šapčanin


EkremPehlić


Belma Pehlivanović-Kelle


Gordan Jančan

ABSTRACT:
Recent research indicates that radicals, such as oxygen's and nitrogen's, are major factors in oxidative stress reactions and has a significant impact on the development of degenerative and inflammatory disorders. Molecule which oxidizes itself and thus protects against oxidation of human cells and tissues or sensitive components in dietary products are named as antioxidans. For the above, we examined selected wild mushrooms that are traditionally used in Bosnian rural areas as food and medicine. The mushrooms Tricholomageorgii, Craterelluscornucopioides and Laetiporussulphureus were examined by carrying out different assays of the reactivity of the mushroom samples against different oxidants. The spectrophotometric method was used for measurement of the complete phenols and complete flavonoids in the methanol: water extracts of the tested mushrooms. The antioxidative activity of the extracts of the examined mushrooms was evaluated by measuring their capacity to neutralize radicals: $DPPH^{*}$, $ABTS^{*+}$, OH^{*}, O_2^{*-}, NO^{*}, and to reduce the Fe^{3+}-TPTZ complex. Thecomplete phenols content, flavonoids content and obtained values of antioxidative activity against various radicals,, in the studied wild mushrooms indicate a significant health potential of these mushrooms, ...

Keywords:*wild mushrooms, ROS, antioxidant, antioxidative activity assays.*

REZIME:
Najnovija istraživanja pokazuju da su radikali, kao što su kisikovi i nitrogenovi, glavni faktori u reakcijama oksidativnog stresa i imaju značajan utjecaj na razvoj degenerativnih i upalnih poremećaja. Molekula koja se sama oksidira i tako štiti od oksidacije ljudskih stanica i tkiva ili osjetljive komponente u dijetalnim proizvodima nazivaju se antioksidansima. Radi navedenog, ispitali smo odabrane divlje gljive koje se tradicionalno koriste u bosanskohercegovačkim ruralnim područjima kao hrana i lijek. Gljive Tricholoma georgii, Craterellus cornucopioides i Laetiporus sulphureus ispitivane su različitim testovima reaktivnosti uzoraka gljiva na različite oksidanse. Za mjerenje kompletnih fenola i kompletnih flavonoida u metanol: vodenim ekstraktima ispitivanih gljiva korištena je spektrofotometrijska metoda. Antioksidativna aktivnost ekstrakata ispitivanih gljiva procenjena je merenjem njihovog kapaciteta da neutrališu radikale: DPPH, $ABTS^{*+}$, OH*, O_2*, NO* i redukuju kompleks Fe^{3+}-TPTZ. Kompletan sadržaj fenola, sadržaj flavonoida i dobijene vrijednosti antioksidativne aktivnosti prema različitim radikalima, u proučavanim divljim gljivama ukazuju na značajan zdravstveni potencijal ...*

Ključne riječi: *divlje gljive, ROS,antioksidans, testovi antioksidativne aktivnosti.*

CHEMICAL CHARACTERIZATION AND POTENTIAL HEALTH BENEFITS OF WILD MUSHROOMS FROM EASTERN BOSNIA

HEMIJSKA KARAKTERIZACIJA I POTENCIJALNI ZDRAVSTVENI BENEFITI OD DIVLJIH GLJIVA IZ ISTOČNE BOSNE

Aida Šapčanin[1], Ekrem Pehlić[2], Gordan Jančan[3], Alija Uzunović[4]
[1]Faculty of Pharmacy, University of Sarajevo, Bosnia and Herzegovina
[2]Faculty of Health Studies, University of Bihac, Bosnia and Herzegovina
[3]Chemilab d.o.o., Ljubljana, Slovenia
[4]Agency For Medicinal Products And Medical Devices of Bosnia and Herzegovina


Aida Šapčanin


Ekrem Pehlić


Gordan Jančan


Alija Uzunović

ABSTRACT:
Biologically active compounds found in mushrooms have long been the subject of interest of researchers for the preparation of natural-based medicinal supplements. Mushrooms are traditionally used and collected in our area from spring to autumn. The aim of this work is to perform a chemical characterization of mushrooms: Tricholoma georgii, Craterellus cornucopioides and Laetiporus sulphureus (collected in the mountains of Jahorina and Sjemeč, Eastern Bosnia) on the content of different fatty acids, vitamins and carbohydrates. Metals: Cu , Zn, Ca, K, Co, Mg, Na, Fe, Se, Cu, As, Co, Ni, Cr, Pb and Cd) were measured in lyophylised and microwave digested samples by using an atomic absorption spectrometry (AAS). Mushrooms are well known potential source of accumulated heavy metals. Furthermore, wild mushrooms are proten rich food. Interelemental correlation and a health risk assessment was made due to the accumulation of metals in the investigated wild mushroom species, ... The results pointed the validity of the hypothesis that the selected species are potential sources of nutraceuticals.

Key words: *wild mushrooms, chemical characterization, health benefit.*

REZIME:
Biološki aktivni spojevi koji se nalaze u gljivama dugo su bili predmet interesovanja istraživača radi pripreme ljekovitih suplemenata na prirodnoj bazi. Gljive se na našim prostorima tradicionalno koriste i sakupljaju od proljeća do jeseni. Cilj ovog rada je da se izvrši hemijska karakterizacija gljiva: Tricholoma georgii, Craterellus cornucopioides i Laetiporus sulphureus (sakupljene na planinama Jahorina i Sjemeč, Istočna Bosna) na sadržaj različitih masnih kiselina, vitamina i ugljikohidrata. Metali: Cu, Zn, Ca, K, Co, Mg, Na, Fe, Se, Cu, As, Co, Ni, Cr, Pb i Cd) mjereni su u liofiliziranim i mikrovalno digestiranim uzorcima upotrebom atomske apsorpcione spektrometrije (AAS). Gljive su poznati potencijalni izvor akumuliranih teških metala. Osim toga, divlje gljive su hrana bogata proteinima. Urađena je međuelementna korelacija i procjena zdravstvenog rizika radi akumulacije metala u istraživanim vrstama divljih gljiva, ... Rezultati su ukazali na valjanost hipoteze da su odabrane vrste potencijalni izvori nutraceutika.

Ključne riječi: *divlje gljive, hemijska karakterizacija, zdravstvena dobrobit.*

ANTHROPOGENIC IMPACT ON ORGANIC MATTER POLLUTION OF THE BREGAVA RIVER

ANTROPOGENI UTICAJ NA ZAGAĐENOST RIJEKE BREGAVE ORGANSKOM MATERIJOM

Dalila Ivanković[1], Almir Šestanc[2], Aldina Kesić[3], Aida Crnkić[4]
[1]University Džemal Bijedić Mostar, Faculty of Education, Mostar, Bosnia and Herzegovina
[2,3,4]University of Tuzla, Faculty of Natural Sciences and Mathematics, Tuzla, Bosnia and Herzegovina


Dalila Ivanković


Almir Šestan


Aldina Kesić


Aida Crnkić

ABSTRACT:
Water is one of the basic and necessary conditions for the survival and development of living organisms on Earth. Immoderate and thoughtless use of water causes a series of unwanted consequences for nature and people. Any deviation of the water quality from the prescribed physical, chemical and biological characteristics of drinking water can be considered as pollution and contamination.The Bregava River originates from the permanent springs of Bitunja and Hrgud and the periodic springs of Mali and Veliki Suhovic. The larger place it flows through is Stolac.In this paper analyzed physical and chemical parameters which determine the oxygen balance of the Bregava River watercourse, in four different seasons, when the water level of the river is different.The oxygen balance is determined by the amount of waste matter that has entered the environment and processes that affect their further fate. Oxygen balance of the waters should indicate the degree of loading of the watercourse with organic matter as a result of anthropogenic influence, and their dependence on climatic conditions.

Key words: *oxygen balance, organic matter, physical-chemical, anthropogenic, pollution*

REZIME:
Voda je jedan od osnovnih, neophodnih, uslova za opstanak i razvoj živih organizama na Zemlji. Neumjereno i nepromišljeno korištenje voda uzrokuje niz neželjenih posljedica na prirodu i čovjeka. Svako odstupanje kvaliteta vode od propisanih fizičkih, hemijskih i bioloških karakteristika pitke vode može se smatrati zagađenjem i kontaminacijom.Rijeka Bregava nastaje od stalnih vrela Bitunje i Hrguda i periodičnih vrela Malog i Velikog Suhovića. Veće mjesto kroz koje protiče je Stolac. U ovom radu analizirani su fizičko hemijski parametri koji određuju kiseonični balans vodotoka rijeke Bregave i to u četiri različita godišnja doba, kada je vodostaj rijeke različit. Kiseonični balans uslovljena je količinom otpadne materije koja je dospjela u životnu sredinu, ali i procesima koji utiču na njihovu dalju sudbinu. Kiseonični balans vode rijeke Bregave treba da ukažu na stepen opterećenosti vodotoka organskom matrrijom kao posljedice antropogenog uticaja, te njihovu zavisnost od klimatskih uslova.

Ključne riječi: *kiseonični balans, organska materija, fizičko-hemijski, antropogeni, zagađenje*

ENVIRONMENTAL FLOW – OSANICA RIVER
EKOLOŠKI PRIHVATLJIV PROTICAJ – RIJEKA OSANICA

Mujčić Mirza[1], Hadžić Emina[2]
[1]Hydro-Engineering Institute Sarajevo, Sarajevo, Bosnia and Herzegovina
[2]Faculty of Civil Engineering, University of Sarajevo, Sarajevo, Bosnia and Herzegovina


Mirza Mujčić


Emina Hadžić

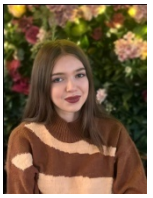
ABSTRACT:
In order to protect water resources, timely societal responses are required to address various forms of pressure, managing this exceptionally important natural resource sustainably. This involves the integrated management of both groundwater and surface water, including transitional and coastal waters.To maintain or restore the structure and function of water-related ecosystems and contribute to preventing water quality degradation and achieving environmental protection goals through sustainable water use, the Environmental Flow (EF) is determined.The Environmental Flow (EF) calculation was performed for the Small hydropower (SHP) Osanica profile (Osanica River) in accordance with the current legislative framework of the Federation of Bosnia and Herzegovina. Additionally, several methods were considered following legal procedures in other countries such as France, Austria, the United States, Switzerland, and Croatia. EF was calculated for each method, and a comparative analysis of the results was conducted. Upon comparing the EF values, it is concluded that the EF value calculated using the methodology of the Federation of Bosnia and Herzegovina (FBiH) aligns relatively well with the EF values obtained through the methods used in calculations in other countries.
Keywords: *water resources, ecosystems, environmental flow, hydrological methods, Osanica River*

REZIME:
Kako bi se očuvao vodni resurs, potrebni su pravovremeni odgovori društva na sve vidove pritisaka, u smislu upravljanja ovim iznimno važnim prirodnim resursom na održivi način koji podrazumijeva integralno upravljanje podzemnim te površinskim, uključujući i prijelazne i priobalne vode. Radi održavanja ili vraćanja strukture i funkcije vodenih i uz vodu vezanih ekosistema, doprinoseći sprječavanju degradacije stanja voda i ostvarenju ciljeva zaštite okoliša kroz održivo korištenje vode, određuje se ekološki prihvatljiv proticaj (EPP).
U radu je izvršen proračun EPP-a za profil MHE Osanica, rijeka Osanica, u skladu sa važećom zakonskom legislativom Federacije Bosne i Hercegovine. Također, u radu je izdvojeno nekoliko metoda po zakonskim procedurama drugih zemalja, kao što su Francuska, Austrija, SAD, Švicarska i Hrvatska. Za svaku od metoda je izvršen proračunat EPP, te napravila međusobna usporedba dobijenih rezultata. Poredeći vrijednosti EPP-a, zaključuje se da vrijednost EPP-a koji je proračunat po metodologiji FBiH, relativno dobro odgovara vrijednostima EPP-a koji bi se dobili po metodama proračuna drugih zemalja.
Ključne riječi: *vodni resurs, ekosistem, ekološki prihvatljiv proticaj, hidrološke netode, rijeka Osanica*

MONTE CARLO SIMULATION IN HEALTH RISK ASSESSMENT OF SULFUR DIOXIDE EXPOSURE – A PIVOTAL FACTOR FOR FUTURE AIR QUALITY REGULATION

Maida Šljivić Husejnović[1], Alija Uzunović[2], Medina Husanović[1], Mlivo Emira[3]
[1]Faculty of Pharmacy, University of Tuzla, Bosnia and Herzegovina
[2]Agency for Medicinal Products and Medical Devices,
Sarajevo, Bosnia and Herzegovina
[3]Faculty of Pharmacy and Health, University of Travnik,
Travnik, Bosnia and Herzegovina

Maida Šljivić Husejnović



Emira Mlivo

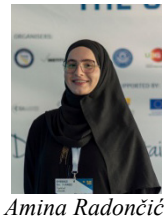
ABSTRACT:
Sulfur dioxide (SO_2) emissions, stemming from industrial processes and fossil fuel combustion, pose significant threats to both the environment and human health. In this study, we aimed to evaluate SO_2 levels in Tuzla city's atmospheric air during 2019 and 2020, and to assess associated health risk.The concentrations ranged from 3.90–147.00 μg/m3 in 2019 and 3.50–1198.80 μg/m3 in 2020, according to monitoring data. The national threshold was exceeded on 34.25% and 21.74% of days in 2019 and 2020, respectively.Conventional deterministic risk assessment indicated that exposure to SO_2 did not enhance the hazards to adult or pediatric health. However, applying Monte Carlo simulation revealed that 0.30% of adults, and 6.60% of children were at increased health risk during 2020, despite the mean SO_2 concentration was within an acceptable range (41.38±3.55). This study underscores the critical role of meticulous SO_2 emission monitoring and subsequent health risk assessments in comprehending, reducing, and preventing potential health hazards linked to air pollution. The integration of Monte Carlo simulation emerges as a proactive strategy for shaping future air quality regulation. By offering nuanced insights into potential health risks, this simulation technique equips policymakers to formulate targeted and effective regulations, enhancing the accuracy of risk assessments and fostering adaptive, science-based strategies to preserve and elevate air quality standards. As we navigate environmental and human health complexities, the integration of Monte Carlo simulation becomes indispensable tool, propelling us towards a future where air quality regulations are not only robust but also tailored to safeguard humans and the ecosystem.

Keywords: *airpollution, probabilistic risk assessment, air quality legal framework, sulfur dioxide*

HARMONIZING NEUROTHERAPEUTICS -THE UNION OF NON-INVASIVE BRAIN STIMULATION, EEG, AND ARTIFICIAL INTELLIGENCE

HARMONIZACIJA NEUROTERAPIJE - SPOJ NEINVAZIVNE STIMULACIJE MOZGA, EEG-A I UMJETNE INTELIGENCIJE

Amina Radončić
[1]International Burch University, Faculty of Engineering, Natural and Medical Sciences, Department of Genetics and Bioengineering, Sarajevo, Bosnia and Herzegovina



Amina Radončić

ABSTRACT:
Noninvasive neurotherapy marks a burgeoning frontier in neuroscience, presenting promising avenues for therapeutic innovation. This comprehensive review delves into the dynamic synergy among Non-invasive Brain Stimulation (NIBS), Electroencephalography (EEG), and Artificial Intelligence (AI), elucidating their collective role in propelling advancements within this fascinating domain. Despite limited scholarly exploration, this study conducts a thorough review, unveiling the symbiotic relationship between NIBS, EEG, and AI. Emphasizing their combined impact on diagnostic precision, treatment personalization, and therapeutic efficacy in neurological disorders, the analysis underscores the integration of real-time EEG monitoring, innovative NIBS methodologies, and AI-driven analytics. This exploration aims to illuminate their collaborative potential in revolutionizing neurotherapeutic approaches.

Keywords: *non-invasive brain stimulation,electroencephalogram, artificial intelligence, Neurotherapy, neuroscience*

REZIME:
Neinvazivna neuroterapija označava procvatnu granicu u neuroznanosti, predstavljajući obećavajuće puteve za terapijske inovacije. Ova sveobuhvatna recenzija istražuje dinamičnu sinergiju između neinvazivne stimulacije mozga (NIBS), elektroencefalografije (EEG) i umjetne inteligencije (AI), objašnjavajući njihovu zajednički ulogu u potiskivanju napretka unutar ovog fascinantnog područja. Uprkos ograničenimnaučno-istraživačkim resursima,, ovaj studij provodi temeljitu recenziju, otkrivajući simbiotički odnos između NIBS-a, EEG-a, i umjetne inteligencije. Naglašavajući njihov kombinovani utjecaj na preciznost dijagnostike, personalizaciju tretmana i terapijsku učinkovitost u neurološkim poremećajima, analiza ističe integraciju praćenja EEG-a u stvarnom vremenu, inovativnih metodologija NIBS-a i analitike koju pokreće umjetna inteligencija. Ovo istraživanje ima za cilj osvijetliti njihov suradnički potencijal u revolucioniranju neuroterapijskih pristupa.

Ključne riječi: *neinvazivna stimulacija mozga, elektroencefalogram, umjetna inteligencija, neuroterapija, neuroznanost*

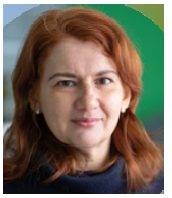
CARBON FIBER FOR STRUCTURAL PURPOSES BASED ON AROMATIC POLYAMIDE PHENYLONE C-2

UGLJENIČNA VLAKNA ZA STRUKTURNE SVRHE BAZIRANA NA AROMATIČNOM POLIAMIDU FENILONU C-2

Olga Chihvintseva[1], Iryna Rula[1], Yulia Boyko[1], Dragoljub Mirjanić[2]
[1]Dnipro State Agrarian and Economic University, Dnipro, Ukraine,
[2]Academy of Sciences and Arts of the Republic of Srpska,
Banja Luka, Bosnia and Herzegovina


Olga Chihvintseva


Iryna Rula


Yulia Boyko


Dragoljub Mirjanić

ABSTRACT:
For the purpose of creating a plastic for structural purposes, the aromatic polyamide phenylone C-2 was reinforced with chromium-containing carbon fiber in an amount of 17 wt. %. As a result of a set of studies of the structure, thermophysical, physico-mechanical and tribological properties, it was found that the reinforcement of aromatic polyamide makes it possible to obtain a material with improved performance characteristics. The engineered carbon fiber having high thermal resistance, thermal conductivity and wear resistance is characterized by a low linear expansion thermal coefficient and friction factor, is operable in a wide range of specific pressures and sliding speeds and can be used for products operating in friction units of movable joints of machines and machinery.

Keywords: *aromatic polyamide, chromium-containing carbon fiber, carbon plastics, properties.*

REZIME:
U svrhu stvaranja plastike za strukturalne svrhe, aromatični poliamid fenilon S-2 ojačan je karbonskim vlaknima koja sadrže krom u količini od 17 tež. %. Kao rezultat niza studija strukture, termofizičkih, fizičko-mehaničkih i triboloških svojstava, utvrđeno je da ojačanje aromatičnim poliamidom omogućava dobijanje materijala sa poboljšanim karakteristikama performansi. Konstruirana karbonska vlakna koja imaju visoku toplinsku otpornost, toplinsku provodljivost i otpornost na habanje karakteriziraju niski termički koeficijent linearne ekspanzije i faktor trenja, mogu se koristiti u širokom rasponu specifičnih pritisaka i brzina klizanja i mogu se koristiti za proizvode koji rade u frikcionim jedinicama pokretni zglobovi mašina i mašina.

Ključne riječi: *aromatični poliamid, karbonska vlakna koja sadrže krom, karbonska plastika, svojstva.*

MAGNETICALLY ASSISTED ELECTROCOAGULATION COMBINED WITH ZEOLITE: OPPORTUNITIES AND CHALLENGES IN COMPOST WASTEWATER TREATMENT

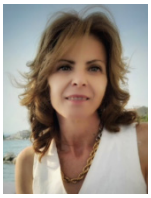
MAGNETSKI POTPOMOGNUTA ELEKTROKOAGULACIJA KOMBINIRANA SA ZEOLITOM: MOGUĆNOSTI I IZAZOVI U OBRADI KOMPOSTNIH OTPADNIH VODA

Nediljka Vukojević Medvidović[1], Ladislav Vrsalović[1], Sandra Svilović[1], Senka Gudić[1], Silvia Bućma[1]
[1]Faculty of Chemistry and Technology, University of Split, Split, Croatia


Nediljka V. Medvidović


Ladislav Vrsalović


Sandra Svilović


Senka Gudić


Silvia Bućma

ABSTRACT:
Magnetically assisted electrocoagulation combined with zeolite (ECZ-MAG) was investigated for the first time as a hybrid treatment method. Influence of the magnet assistance (ECZ-MAG vs. ECZ), the contact time of 10-30 min, and the initial pH values (without and with pH adjustment at pH=3.72) were investigated. The assistance of magnetNdFeB increases the fouling of the carbon steel electrodes. Both hybrid types allow 80-100% recovery of the powder saturated zeolite for further regeneration. Taguchi optimisation highlight contact time is the most important factor for COD reduction, settling velocity and electrodes consumption, while magnet assistance is the most important factor for voltage consumption.

Keywords: *hybrid process, magnet, electrocoagulation, zeolite, compost wastewater treatment*

REZIME:
Magnetski potpomognuta elektrokoagulacija kombinirana sa zeolitom (ECZ-MAG) prvi je put ispitana kao hibridna metoda obrade. Istraživan je utjecaj magneta (ECZ-MAG vs. ECZ), vremena kontakta od 10-30 min te početne pH vrijednosti otopine (bez i sa podešavanjem pH na pH=3.72). Prisutnost magneta NdFeB povećavaposivaciju elektroda od ugljičnog čelika. Oba hibridna sustava omogućuju 80-100% povrata zasićenog praškastog zeolita za daljnju regeneraciju. Taguchi optimizacija je istaknula vrijeme kontakta najutjecajnijim faktorom na smanjenje KPK, brzinu taloženja i potrošnju elektroda, dok je prisutnost magneta najutjecajnija na potrošnju napona.

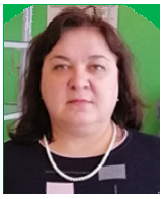
Ključne riječi: *hibridni proces, magnet, elektrokoagulacija, zeolit, kompostnaotpadna voda*

THE QUANTUM-CHEMICAL ASPECTS OF STRUCTURING FOR SOME ARAMIDE-TYPE POLYMER SYSTEMS WITH HETARYL FRAGMENTS

KVANTNO-HEMIJSKI ASPEKTI STRUKTUIRANJA ZA NEKE POLIMERNE SISTEME ARAMIDNOG TIPA SA HETARILNIM FRAGMENTIMA

Andrey Tokar[1], Olga Chihvintseva[1], Dragoljub Mirjanić[2]
[1]Dnipro State Agrarian and Economic University, Dnipro, Ukraine
[2]Academy of Sciences and Arts of the Republic of Srpska, Banja Luka, Bosnia and Herzegovina


Andrey Tokar


Olga Chihvintseva


Dragoljub Mirjanić

ABSTRACT:
Using ab initio methods of quantum chemistry the structure of molecular complexes based on two molecules of benzanilide as well as benzo[de]benzo[4,5]imidazo[2,1-a]-isoquinolin-7-one with 2,2-diphenylpropane fragment for a rigid-chain polyheteroarylene system have been considered in details. Some intra- and intermolecular hydrogen bonding effects with electrostatic contributions in total stabilization energy have been evatuated at natural bond orbital and atoms-in-molecules theory. The proposed theoretical models are validated in reflection of structural and energetic parameters for investigating systems and could be critical with regard to the preestimation of identity of single components while producing new composite materials based on them.

Keywords: *ab initio calculation, natural bond orbital, topological analysis, atoms-in-molecules theory, basis set superposition error, hydrogen bond, electrostatic interaction.*

REZIME:
Koristeći ab initio metode kvantne hemije, struktura molekularnih kompleksa zasnovanih na dva molekula benzanilida kao i benzo[de]benzo[4,5]imidazo[2,1-a]-izokinolin-7-ona sa 2,2-difenilpropanski fragment za poliheteroarilenski sistem krutog lanca detaljno su razmotreni. Neki efekti intra- i intermolekularne vodonične veze sa elektrostatičkim doprinosima u ukupnoj stabilizacijskoj energiji evatuirani su u teoriji orbitala prirodne veze i atoma u molekulima. Predloženi teorijski modeli su validirani u odrazu strukturnih i energetskih parametara za istraživanje sistema i mogli bi biti kritični u pogledu predocjenjivanja identiteta pojedinačnih komponenti pri proizvodnji novih kompozitnih materijala na temelju njih.

Ključne riječi: *ab initio proračun, prirodna orbitala veze, topološka analiza, teorija atoma u molekulima, greška superpozicije bazičnog skupa, vodikova veza, elektrostatička interakcija.*

AN INTEGRATED HEALTH RISK ASSESSMENT APPROACH TO THE STUDY OF CARBONATED WATER SPRING FROM TUZLA AREA, BOSNIA AND HERZEGOVINA

Maida Šljivić Husejnović[1], Almedina Palavrić[1], Azra Suljić[1], Emira Mlivo[2]
[1]Faculty of Pharmacy, University of Tuzla, Bosnia and Herzegovina
[2]Faculty of Pharmacy and Health, University of Travnik, Bosnia and Herzegovina


Maida Šljivić Husejnović


Almedina Palavrić


Azra Suljić


Emira Mlivo

ABSTRACT:
This study investigates the quality and potential health risks associated with natural carbonated spring water taken in 2023 in Tuzla, Bosnia and Herzegovina. Employing a multidisciplinary approach, we conducted extensive physicochemical analyses to characterize the water, assessing mineral and ionic content, organoleptic properties, and potential contaminants of geological and anthropogenic origins. Subsequently, a deterministic human health risk assessment was undertaken for the ingestion of individual contaminants, while an integrated approach was used to assess the overall health risk from the consumption of this water by the local population. Surprisingly, despite its natural origin, the water exhibited elevated levels of fluoride (F^-), cadmium (Cd), lead (Pb), and iron (Fe), exceeding recommended health standards. Although, the presence of F^- in concentration of 1.65±0.29 mg/L, Cd 0.07±0.01 mg/L, Pb 0.176±0.02 mg/L, and Fe 0.69±0.24 mg/L resulted in an acceptable individual health risk, the integrated approach revealed an increased risk associated with the consumption of the water (HQ=2.28). This underscores the importance of adopting the integrated approach in health risk assessment, considering the additive effect of various contaminants. The study emphasizes the necessity for ongoing monitoring, regulatory measures, and public awareness to mitigate the identified health risks, ensuring the safe consumption of natural carbonated spring water from Tuzla.

Keywords: *water pollution, deterministic health risk assessment, additive effect, integrated approach*

1. INTRODUCTION

Although drinking water is essential for human life, people all over the world face its deficit at same point. Even countries naturally rich in water are not spared from this problem due to continuous environmental pollution. Among all water sources, natural water springs are considered the choice of the lowest health risk, yet they face their own challenges in maintaining that status.

INCREASING THE PRODUCTIVITY OF FIBER COATING LINE IN CABLE PRODUCTION BY ELIMINATING WASTE IN MATERIAL FLOW USING DMAIC LEAN SIX SIGMA TOOLS AND MINITAB APPLICATION

Ismar Alagić
International University of Sarajevo, Ilidža, Bosnia and Herzegovina
University of Zenica, Faculty of Mechanical Engineering, Zenica, Bosnia and Herzegovina

Ismar Alagić

ABSTRACT:
In this paper, the author will point out the application of Lean Six Sigma tools in order to increase the productivity of the sheathing line in cable production. The previous analysis determined that auxiliary times when changing tools on extruders and replacing inputs and outputs are too large. The problem includes all items, i.e. all product changes on the fibercoating line in cable production. This LSS project follows DMAIC stages and application of following techniques: Project charter, SIPOC, CTQ, VSM, Ishikawa diagram, Cause and Effect Matrix, Histograms, Pareto analysis and SPC are applied. In order to eliminate waste in flow material process, the process capability analysis for changing tools on extruder No.2 is done. This article is the result of several years of author's work in the field Lean Six Sigma project implemented in working conditions of manufacturing oriented companies. This article provides proposal a set of approaches that are the basis for the development and application of the Minitab as statistical tool for Lean Six Sigma approach.

Key words: *Lean Six Sigma (LSS), DMAIC, fiber coating line, cable production, productivity, Minitab.*

1. KANBAN AND TAKT TIME WITH SETTLEMENT OF BOTTLENECK PROCESSES

Kanban is a method and tool for planning and managing the flow values, first of all material, which is often used in organizations that operate on the principles of Lean and Just in Time. Thus, the Kanban method based on the clear and transparent performed processing of value, and which in combination with the pull method, the JIT, 5S, and other concepts is leading to the establishment of a Lean organization [1]. Main power and the use of Kanban system lies in the management of production during planned and transparent manner. Kanban system clearly indicates the existence of waste, bottlenecks and opportunities for improvement process.

EXAMPLE OF HYPOTHESIS TESTING THROUGH MINITAB APPLICATION IN THEORY OF EXPERIMENT MODELLING FOR LEAN SIX SIGMA PROJECT OF INDUSTRIAL PURPOSE

Ismar Alagić
International University of Sarajevo, Ilidža, Bosnia and Herzegovina
University of Zenica, Faculty of Mechanical Engineering, Zenica, Bosnia and Herzegovina

Ismar Alagić

ABSTRACT:
The way hypotheses testing is performed, is analogue to proving guilt of an accused one in the court by prosecutor. The goal of prosecutor is to prove by gathered evidences that, beyond reasonable doubt, the accused one is “guilty“. If we don’t do that, the jury will decide there are not enough evidences to sentence the accused one. Lean Six Sigma project has the same task, to prove that if we change some input ”x“, the process will change and deliver different outputs “y“, and in order to do that we need to generate data before and after change of input “x“ and to prove beyond any doubt (alpha risk) that change of input “x“ brought to change of output “y“. All steps in hypotheses testing for Lean Six Sigma project of industrial purpose in this article are presented. During this experiment, we use Minitab as best known statistical software package for Lean Six Sigma projects through a set of programs that have been developed to carry out statistical analysis of a high degree of numerical accuracy .In this article, example of Minitab application on example of theory of experiment modelling on the influence of the impact of operating temperatures and three types of glass plates in the manufacture of the oscilloscope tube for industrial purpose is presented.

Key words: *Hypothesis testing, Minitab, theory of experiment, oscilloscope, industrial purposes, Lean Six Sigma (LSS).*

1. INTRODUCTION

The statistical technique for finding dependencies (correlation, partial correlation, multiple regression, logical regression analysis and factor analysis) and statistical techniques to compare groups (non-parametric technique, t-test, analysis of variance ANOVA, analysis of variance of two more variables such as multivariate analysis, and analysis-Analysis of Variance covariance - ANCOVA) are the tools to carry out statistical processing [1]. In this article, example of Minitab application on example of theory of experiment modelling on the influence of the impact of operating temperatures and three types of glass plates ....

THE APPLICATION OF DILO (A DAY IN THE LIFE OF) ANALYSIS METHOD INTO LEAN KAIZEN PROGRAMME IN WORKING CONDITIONS OF MANUFACTURING COMPANY

Ismar Alagić
International University of Sarajevo, Ilidža, Bosnia and Herzegovina
University of Zenica, Faculty of Mechanical Engineering, Zenica, Bosnia and Herzegovina

Ismar Alagić

ABSTRACT:
Lean principles (value, current value, currents, withdrawal and perfection) have changed the behaviour of the participants in the work processes and created working environment in which the routing operation is performed on the process of labour, the elimination of losses in the process of work, continuous training of employees at all organizational levels in order to achieve shorter delivery times and cost competitive products. In this way, the companies have introduced the Lean concept in response to the activities known as the Japanese term "muda" that consumes resources, rather than creating value. In this article the application of analysis method called DILO (a Day In Life Of) through Lean Kaizen prograame in domestic metalworking company is presented. It is a tool which helps company to identify the non-value added (NVA) activities and time during one working day. The final goal will be to eliminate NVA activities and replace them with VA activities. DILO is a method which maps individual activities, almost minute by minute, and record them in categories.

Key words: *Lean Manufacturing, DILO (A Day in the Life of), NVA (Non Value Added) activity, VA (Value Added) activity, RNVA (Necessary Requested Non Value Added) activity, Processing industry.*

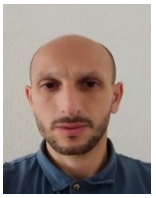
1. INTRODUCTION

Taichi Ohno, the director of Toyota Company, introduced innovations with the aim of providing continuity of process flow and variety of bids, then he identified seven types of "Waste-Muda" and established a Toyota Production System [1]. In fact, the lean concept philosophy is the most effective "antidote" for the waste. Based on all the above we can answer the question:"What's the Lean Concept"? "The Lean concept represents a set of procedures that systematically generate useless workflow processes as well as sources of error, with the aim to influencing quality, cost and production time." If we want to say it in simple words, what is this "lean management"? The answer would be: "Creating value without loss" [2].

ON THE DYNAMICS OF RATIONAL DIFFERENCE EQUATION WITH NONLINEAR TERMS

DINAMIKA RACIONALNE DIFERENTNE JEDNAČINE SA NELINEARNIM ČLANOVIMA

Jasmin Bektešević[1] , Vahidin Hadžiabdić[1], Midhat Mehuljić[1], Haris Lulić[1]
[1]Faculty of Mechanical Engineering, University of Sarajevo, Sarajevo, Bosnia and Herzegovina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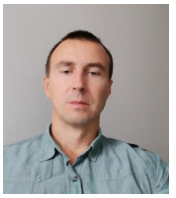

Midhat Mehuljić


Haris Lulić

ABSTRACT:
Our research will be focused on the local and global behavior of the following rational difference equations of the form

$$x_{n+1} = \frac{x_n}{P(x_n)P(x_{n-1})} \quad and \quad x_{n+1} = \frac{x_{n-1}}{P(x_n)P(x_{n-1})}$$

where $P(x)$ *is polynomial with nonnegative coefficients with propertiy* $P(0) > 0$ *with initial conditions belonging to the positive quadrant.*

Keywords: *local (global, asymptotic) stability of equilibrium(s), periodicity, cycles analysis, boundedness.*

REZIME:
Diferentne jednačine imaju niz primjena u matematičkim modelima u biologiji, ekonimiji, fizici, hemiji, a redovno se javljaju kod numeričkog rješavanja običnih diferencijalnih jednačina. Jednostavan oblik jednačine ne povlači obavezno i jednostavnu njenu dinamiku. Naprotiv, dinamika može biti veoma komplicirana, čak i haotična. Najčeće nismo u mogućnosti egzaktno riješiti diferentnu jednačinu, stoga nastojimo odrediti bazene privlačenja svih tačaka ekvilibrijuma i periodičkih rješenja.
U općem slučaju, za ispitivanje globalne dinamike diferentnih jednačina drugog reda koristi se teorija monotonih preslikavanja u ravni, koja nam garantuje egzistenciju monotone krive (stabilna, nestabilna i centralna mnogostrukost) koja razdvaja bazene privlačenja, ali ne postupak nalaženja njene jednačine. U ovom radu, mi smo uspjeli naći eksplicitan oblik jednačine krive koja razdvaja bazene privlačenja nula ekvilibrijuma i tačke u beskonačnosti i time u potpunosti opisati dinamiku date diferentne jednačine. U kompleksnom slučaju ta kriva je poznata kao Julija skup.

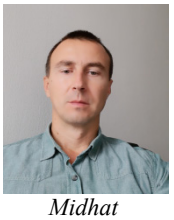
Ključne riječi: *lokalna (globalna, asimptotska)stabilnost ekvilibrijuma, periodičnost, analiza stabilnosti periodičkih rješenja, ograničenost*

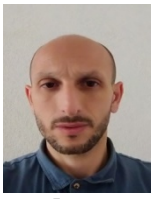
DYNAMICS OF A CERTAIN DISCRETE COMPETITIVE MODEL

DINAMIKA ODREĐENOG DISKRETNOG KONKURENTSKOG MODELA

Vahidin Hadžiabdić[1], Midhat Mehuljić[1], Jasmin Bektešević[1] , Naida Mujić[2] , Haris Lulić[1]
[1]Faculty of Mechanical Engineering, University of Sarajevo,
Sarajevo, Bosnia and Herzegovina
[2]University of Sarajevo -Faculty of Electrical Engineering,
Sarajevo, Bosnia and Herzegovina


Vahidin Hadžiabdić


Midhat Mehuljić


Jasmin Bektešević


Naida Mujić


Haris Lulić

ABSTRACT:
Systems of difference equations have very rich dynamics, which are sometimes richer than their analogues in continuous situations. We will investigate the local dynamics of such a system, using the theory based on the observation of eigenvalues, as well as the bifurcation theory. The research of dynamic systems and their behavior is important because of their wide application, starting from everyday life, then ecology, biology, engineering and application in engineering, such as traffic flow modeling, which can result in a reduction of pollution. Although these systems are most often linked to populations and their predators, because historically there were some first applications.

Keywords:*equilibrium points*, *Jacobina matrix, local stability, eigenvalues.*

REZIME:
Sistavi diferentnih jednačinai imaju vrlo bogatu dinamiku, koja je ponekad bogatija od svojih analoga u kontinuiranim slučajevima. Istraživat ćemo lokalnu dinamiku takvog sistema, koristeći teoriju koja se temelji na promatranju svojstvenih vrijednosti, kao i teoriju bifurkacije. Istraživanje dinamičkih sistema i njihovog ponašanja važno je zbog njihove široke primjene, počevši od svakodnevnog života, zatim ekologije, biologije, inženjerstva i primjene u inženjerstvu, poput modeliranja prometnih tokova, što može rezultirati smanjenjem onečišćenja. Iako su ti sistemi najčešće povezani s populacijama i njihovim predatorima, jer su se historijski tu javile prve primjene.

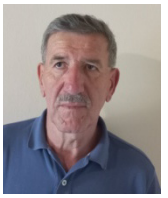
Ključne riječi: *tačake ekvilibrijuma, Jakobijeva matrica, lokalna stabilnost, svojstvene vrijednosti.*

RESEARCH ON THE USE OF TUFF AND SIMILAR INORGANIC MATERIALS IN WILDFIRE FIGHTING

ISTRAŽIVANJE UPOTREBE TUFA I SLIČNIH NEORGANSKIH MATERIJALA ZA GAŠENJE POŽARA

Mario Krzyk[1], Darko Drev[2]
[1]Faculty of Civil andGeodetic Engineering, University of Ljubljana, Ljubljana, Slovenia


Mario Krzyk


Darko Drev

ABSTRACT:
Firefighting in natural environments usually involves the use of water. The water extinguishing mechanism is based on the evaporation of water, which prevents access of oxygen to the surface of the combustible material and cools the burning surface. The effect of water on burning surfaces is generally brief, as most of the water quickly drains from the burning surface and the other portion of the water evaporates due to the high temperatures of the burning surface. This allows the oxygen from the air to come into contact with the burning surface again. In the article, the use of aqueous suspensions based on tuff and similar inorganic materials is proposed to increase the efficiency of firefighting. The main purpose of using water suspensions in extinguishing forest firefighting is to improve the adhesion of the extinguishing agent to combustible materials, which makes it harder to reheat and create a thin inorganic layer on combustible surfaces that hinders the access of oxygen to the combustible surface.

Keywords:*firefighting, water suspension, tuff, clay*

REZIME:
Gašenje požara u prirodnom okruženju obično uključuje korištenje vode.Mehanizam gašenja vodom temelji na isparavanju vode, čime se onemogućuje pristup kisiku površini zapaljivog materijala i hladi goruće površine.Utjecaj vode na goruće površine uglavnom je kratkotrajan, jer većina vode brzo oteče s goruće površine, dok drugi dio ispari zbog visoke temperature.To omogućuje kisiku iz zraka ponovni kontakt sa gorućom površinom.U članku se predlaže korištenje vodenih suspenzija na bazi tufa i sličnih anorganskih materijala za uspješnije gašenja požara.Osnovna svrha korištenja vodenih suspenzija u gašenju šumskih požara je poboljšati prionjivost sredstva za gašenje na zapaljive materijale, čime se postiže njihovo teže ponovno zagrijavanje i stvaranje tankog anorganskog sloja na zapaljivim površinama koji otežavapristup kisiku do njih.

Ključne riječi: *gašenje požara, vodna suspenzija, tuf, glina*

SEISMIC ACTIONS ON BUILDINGS ACCORDING TO THE NATIONAL REGULATIONS AND EUROCODE 8 FOR BOSNIA AND HERZEGOVINA

SEIZMIČKA DJELOVANJA NA ZGRADE PREMA NACIONALNOM PRAVILNIKU I EUROCODE 8 U BOSNI I HERCEGOVINI

Faruk Avdic[1], Sanin Dzidic[2], Emir Hodzic[1], Amir Causevic[3]
[1] International BURCH University, Faculty of Engineering, Natural and Medical Sciences, Study Program: Civil Engineering, Sarajevo, Bosnia and Herzegovina
[2] University of Bihac – Technical Faculty, Department of Civil Engineering, Bihać, Bosnia and Herzegovina
[3] University of Sarajevo, Faculty of Architecture, Sarajevo, Bosnia and Herzegovina


Faruk Avdić


Sanin Dzidic


Emir Hodžić


Amir Causevic

ABSTRACT:
The National Rulebook for Technical Standards for Construction of Buildings in Seismic Areas is still legally valid in Bosnia and Herzegovina including seismological maps for return periods of 50, 100, 200, 500, 1000 and 10000 years. Institute for Standardization of Bosnia and Herzegovina introduced BAS EN 1998-1:2017 (Eurocode 8) in national standardization, while National Annex BAS EN 1998-1/NA:2018 was introduced in 2018, including seismic hazard maps for Bosnia and Herzegovina with reference return periods of 475 and 95 years, as well as an interactive map showing values for reference PGA on type A ground for the same reference return periods. However, application of Eurocodes is not mandatory yet. In this research, comparison, and analysis of seismic forces according to the national Rulebook and Eurocode 8 for several cities in Bosnia and Herzegovina are conducted on the various building models, showing interesting results as a basis for possible further academic and ...

Keywords: *National Rulebook, Eurocode 8, seismic actions, Bosnia and Herzegovina*

SAŽETAK
Pravilnik o tehničkim normativima za izgradnju objekata visokogradnje u seizmičkim područjima je još uvijek pravno obavezujući u Bosni i Hercegovini zajedno sa seizmološkim kartama za povratne periode od 50, 100, 200, 500, 1000 i 10000 godina. Institut za standardizaciju Bosne i Hercegovine je u nacionalnu standardizaciju uveo BAS EN 1998-1:2017 (Eurokod 8) 2017. godine, dok je Nacionalni dodatak EN 1998-1/NA:2018 uveden 2018. godine uključujući karte seizmičkog hazarda za Bosnu i Hercegovinu s referentnim povratnim periodma od 475 i 95 godina, kao i interaktivnu kartu koja prikazuje vrijednosti referentnog maksimalnog ubrzanja tla tipa A za navedene povratne periode. Međutim, upotreba Eurokodova još uvijek nije obavezna. U ovom istraživanju izvodi se komparacija i analiza seizmičkih djelovanja u skladu sa Pravilnikom i Eurokodom 8 za nekoliko gradova u Bosni i Hercegovini na različitim modelima objekta, dobijajući interesantne rezultate kao osnovu za dalje akademske i ...

Ključne riječi: *Nacionalni Pravilnik, Eurocode 8, seizmičke sile, Bosna i Hercegovina*

COMPARISON OF WIND ACTIONS ACCORDING TO JUS STANDARDS AND EN 1991-1-4 IN BOSNIA AND HERZEGOVINA

POREĐENJE DJELOVANJA OD VJETRA PREMA JUS STANDARDIMA I EN 1991-1-4 U BOSNI I HERCEGOVINI

Emir Hodzic[1], Sanin Dzidic[2]
[1]International BURCH University, Faculty of Engineering, Natural and Medical Sciences, Study Program: Civil Engineering, Sarajevo, Bosnia and Herzegovina
[2]University of Bihac – Technical Faculty, Department of Civil Engineering, Bihać, Bosnia and Herzegovina


Emir Hodžić


Sanin Dzidic

ABSTRACT:
Designed wind actions can be determined through JUS standards that are still legally valid in Bosnia and Herzegovina, or through BAS EN 1991-1-4:2015 with its associated National Annex BAS EN 1991-1-4/NA:2018 and wind map for Bosnia and Herzegovina. The design philosophy remained the same, but specific differences are noticeable during the determination of effects. In this research, the differences between the two standards are investigated and, ultimately, the result of those differences is in the form of the designed actions to the structure. Several cities in Bosnia and Herzegovina were taken for the purposes of the research. The structural model is a simple fixed frame, while the differences in wind actions are displayed in the form of effects: bending moment, shear, and axial forces. The results of the research were discussed, and a further direction of the research was suggested.

Keywords: *wind actions, Eurocodes, JUS Standards, wind speed, pressure, Bosnia and Herzegovina*

SAŽETAK:
Određivanje računskih djelovanja vjetrom na objekte se može vršiti u skladu sa JUS standardima koji su još uvijek pravno važeći u Bosni i Hercegovini, ili prema BAS EN 1991-1-4:2015 sa svojim pripadajućim Nacionalnim Aneksom BAS EN 1991-1-4/NA:2018 i kartom vjetra za BiH. Filozofija proračuna je ostala ista, ali su primjetne određene razlike tokom proračuna djelovanja. U ovom istraživanju su analizirane razlike između dvije grupe standarda i u konačnici, rezultat tih razlika u vidu proračunskog djelovanja na konstrukciju. Za potrebe istraživanja je uzeto nekoliko gradova u Bosni i Hercegovini. Konstruktivni model je obostrano uklješteni ram, a razlike od djelovanja vjetra se prikazuju u vidu vrijednosti momenata, savijanja, transverzalnih i normalnih sila. Rezultati istraživanja sudiskutovani, te se predlažu daljnji pravci istraživanja.

Ključne riječi: *djelovanja od vjetra, Eurokodovi, JUS standardi, brzina vjetra, pritisak, Bosna i Hercegovina*

MORTARS WITH MARBLE POWDER AS PARTIAL REPLACEMENT FOR CEMENT

MALTERI SA MRAMORNIM PRAHOM KAO DJELIMIČNA ZAMJENA ZA CEMENT

Armina Breščić[1], Marko Ćećez[2], Merima Šahinagić – Isović[3], Fuad Ćatović[4]
[1, 2,3,4]Dzemal Bijedic University of Mostar, Faculty of Civil Engineering, Mostar, B&H

Armina Breščić

Marko Ćećez

Merima Šahinagić-Isović

Fuad Ćatović

ABSTRACT:
The use of industrial by-products as replacement for cement and/or sand in mortar and concrete production can lead to sustainable development in civil engineering. Cement industry contributes with 8% of total world CO_2emission and is considered as one of the greatest polluters.Marble powder has great potential for application in the construction industry, but there is stilllack of sufficient relevant research. Material used in this study originates from sawing of marble blocks and is a potential environmental threat due to high calcium oxide content. The chemical composition of marble powder also includes silicon,aluminumand iron oxides. Mortar properties with marble powder as partial replacement for cement were analyzed and are presented in this paper.The aim of this paper is to investigate waste marble powder as partial replacement for cement, possibilities, advantages, and disadvantages. Fresh and certain hardened mortar properties are tested and presented in this paper.

Keywords: *sustainable development, industrial waste, marble powder, mortar*

REZIME:
Upotreba industrijskih nusproizvoda kao zamjena za cement i/ili pijesak u proizvodnji maltera i betona može dovesti do održivog razvoja u građevinarstvu. Cementna industrija doprinosi s 8% ukupne svjetske emisije CO_2 i smatra se jednim od najvećih zagađivača. Mramorni prah ima veliki potencijal za primjenu u građevinarstvu, ali još uvijek nedostaje dovoljno relevantnih istraživanja. Materijal korišten u ovoj studiji potiče od piljenja mramornih blokova i potencijalna je prijetnja okolišu zbog visokog sadržaja kalcijevog oksida. Hemijski sastav mramornog praha pored navedenog uključuje i okside silicija, aluminija i željeza. Ispitana i predstavljena su svojstva maltera sa mramornim prahom kao djelomičnom zamjenom za cement. Cilj ovog rada je istražiti otpadni mramorni prah kao djelomičnu zamjenu za cement, mogućnosti, prednosti i nedostatke. U radu su ispitana i prikazana svojstva svježe i određene očvrsle žbuke.

Ključne riječi: *održivi razvoj, industrijski otpad, mramorni prah, malter*

FIRE SPALLING OF CONCRETE

Irfan Bidžević[1], Sanin Džidić[2]
[1]Faculty of Engineering, Natural and Medical Sciences, International Burch University, Sarajevo, Bosnia and Herzegovina
[2]Technical Faculty, University of Bihać, Bihać, Bosnia and Herzegovina

Irfan Bidzevic

Sanin Dzidic

ABSTRACT:
Concrete structures can be compromised by various factors, including fires. However, reinforcement exposure to fire can jeopardize the structural integrity of concrete structures. Such exposure significantly impacts both the load-bearing capacity and serviceability of the structure. Fire spalling, a phenomenon caused by increased temperature or fire, leads to complex microstructural changes in concrete. When concrete is subjected to fire, it undergoes intricate microstructural changes. Above 300 °C, a significant amount of strength is lost, and structural capabilities are substantially compromised. The severity of fire spalling increases with the application of high strength and self-compacting concrete. Moisture, present in volatile and chemically combined forms, plays a crucial role in concrete spalling. Researchers haverecognized that the underlying causative mechanisms of spalling are largely unique to concrete. Non-explosive spalling may occur after heating for 60 minutes or more, which can be mitigated through additional strengthening in the concrete member. While spalling does not imply structural failure, it does impact the overall fire resistance of the element. Therefore, it is essential to follow appropriate safety measures to enhance the fire performance of concrete structures.

Keywords: *concrete, spalling, fire, temperature, moisture.*

1. INTRODUCTION

Spalling of concrete as a natural phenomenon remains an intrigue. When concrete is exposed to fire it subdues complex microstructural changes. Considerable amount of strength is lost from 300°C above and structural capabilities are seriously jeopardized above 600°C. As known by ISO-834 standard fire-time curve, for a temperature of 600°C it is needed approximately 7min – which is exactly when aggregate, surface and explosive spalling can begin, according to Khoury[1]spalling can be defined as“violent or non-violent breaking of layers or pieces of concrete from the surface of a structural element”. When mentioning fire spalling it is strictly caused by increased temperature or fire as a cause. If the spalling becomes explosive it is treated as violent spalling.

PRESERVATION OF CULTURAL HERITAGE ARCHITECTURE BY 3D PRINTING AND REALISTIC 3D MODELS

OČUVANJE OBJEKATA ARHITEKTONSKE KULTURNE BAŠTINE POMOĆU 3D PRINTANJA I REALISTIČNIH 3D MODELA

Nedim Tuno[1], Admir Mulahusić[2], Jusuf Topoljak[3], Marko Savić[4]
[1, 2, 3] University of Sarajevo – Faculty of Civil Engineering, Sarajevo, Bosnia and Herzegovina
[4]Markos, spa, Bratunac, Bosnia and Herzegovina


Nedim Tuno


Admir Mulahusić


Jusuf Topoljak


Marko Savić

ABSTRACT:
The article discusses the significance of heritage buildings, emphasizing their role as cultural icons and essential components of national identity. The traditional photogrammetric methods have always been crucial in the protection, preservation, and valorization of various forms of cultural heritage, including architectural and archaeological sites. The specific focus of the study is on the application of an aerial unmanned photogrammetric platform for documenting the famous Goat's Bridge, recognized as a national monument in Bosnia and Herzegovina. The study employs a highly efficient visualization method for the creation of a three-dimensional model of the bridge. This involves the application of three-dimensional computer graphics and production of the physical models through 3D printing. Such an approach likely enhances the documentation and understanding of the Goat's Bridge, contributing to its preservation and broader appreciation as an important cultural heritage monument.

Keywords: *photogrammetry, architecturalheritage, 3D model, 3D printing*

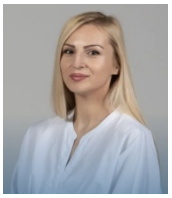
SAŽETAK:
U članku se govori o značaju graditeljskog nasljeđa, kroz naglašavanje njegove uloge kulturne ikone i bitnekomponentne nacionalnog identiteta. Tradicionalne fotogrametrijske metode oduvijek su bile ključne u zaštiti, očuvanju i valorizaciji različitih oblika kulturne baštine, uključujući arhitektonska i arheološka nalazišta. Ova studija je fokusirana na primjenu bespilotne aerofotogrametrijske platforme u dokumentiranju poznate Kozje ćuprije, koja je proglašena nacionalnim spomenikom Bosne i Hercegovine. Korištena je visoko učinkovita metodavizuelizacije za izradu trodimenzionalnog modela mosta. To je uključivalo primjenu trodimenzionalne računarske grafike i izradu fizičkih modela mosta putem 3D printanja. Takav pristup unapređujedokumentovanje i razumijevanje Kozje ćuprije, pridonoseći njenom očuvanju i širem vrednovanju kao važnog spomenika kulturne baštine.

Ključne riječi: *fotogrametrija, arhitektonsko nasljeđe, 3D model, 3D printanje*

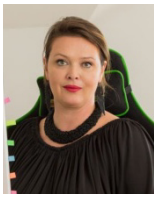
ANALYSIS OF URBAN LAYOUT AND ARCHITECTURAL CONFIGURATION OF PRESCHOOL FACILITIES BUILT UNTIL 1990: A CASE STUDY IN SARAJEVO CANTON

ANALIZA URBANISTIČKE POSTAVKE I ARHITEKTONSKE KONFIGURACIJE PREDŠKOLSKIH OBJEKATA IZGRAĐENIH U PERIODU DO 1990 GODINE: STUDIJA SLUČAJA U KANTONU SARAJEVO I

Nerma Smajlović Orman[1], Adnan Novalić[1], Maja Popovac Roso[2], Ahmed El Sayed[3]
[1]International BURCH University Sarajevo – Faculty of Engineering and Natural Sciences, Department of Architecture, Sarajevo
[2]University “Džemal Bijedić” Mostar – Faculty of Civil Engineering, Mostar
[3]International BURCH University Sarajevo – Faculty of Engineering and Natural Sciences, Department of Civil Engineering, Sarajevo


Nerma Smajlović Orman


Adnan Novalić


Maja Popovac Roso


Ahmed El Sayed

ABSTRACT:
The design of preschool education facilities in Bosnia and Herzegovina until 1990 aimed not only to ensure the quality of education but also to fulfill parameters analyzed within urban settlement plans. These plans precisely determined the locations of preschool buildings, with a particular focus on the capacities of future structures and ...
The findings of this research provide insights into the architectural characteristics of buildings constructed over 35 years ago and analyze their contemporary utilization. In conclusion, this study significantly contributes to understanding the evolution of preschool architecture in the specified historical context, offering valuable guidance for the planning of present and future educational facilities.

Keywords: *preschool education facilities, Sarajevo Canton, urban layout, architectural configuration, preschool capacity*

SAŽETAK:
Projektovanje objekata predškolskog obrazovanja u Bosni i Hercegovini do 1990. godine nije imalo za cilj samo osigurati kvalitet obrazovanja, već i ispuniti parameter analizirane unutar urbanističkih planova naselja. Ti planovi precizno su određivali lokacije predškolskih zgrada, sa posebnim naglaskom na kapacitet i ...
Reziltati ovog istraživanja pružaju uvid u arhitektonske karakteristike objekata izgrađenih prije više od 35 godina i analizu njihovog suvremenog korištenja. Zaključno, ovo istraživanje značajno doprinosi razumijevanju evolucije arhitekture predškolskih objekata u određenom historijskom kontekstu, nudeći vrijedno usmjerenje za planiranje sadašnjih i budućih obrazovnih objekata.

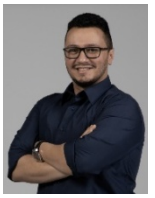
Ključne riječi: *objekti predškolskog obrazovanja, Kanton Sarajevo, urbanistička postavka, arhitektonska konfiguracija, kapaciteti predškolske ustanove*

A REVIEW ON GENERAL PRINCIPLES AND REGULATIONS OF NEW ADDITIONS IN THE CASE OF ARCHITECTURAL HERITAGE PROTECTED BUILDINGS

Yousef Zaarir[1], Adnan Novalic[2], Ahmed Elsayed[3]
[1]International Burch University, Faculty of Engineering and Natural Sciences, Sarajevo, Bosnia and Herzegovina


Yousef Zaarir


Adnan Novalič


Ahmed Elsayed

ABSTRACT:
New constructed additions to protected heritage buildings are used as an essential method in case of adaptive reuse process. Providing new spaces to the host buildings serves to apply new functions to historic and heritage buildings that need to be preserved under today's conditions. This research paper aims to discuss the significance of new additions, analysing methods of its construction, its location, and position in accordance to heritage-protected buildings. A qualitative research methodology used in this paper based on an in-depth study and review of various literature related to the topic. By analysing various researches, which concentrate on the adaptive reuse process of historic and heritage buildings. Results of the research is to conclude and summarize the main principles and regulations related to the new spaces and new additions to heritage-protected buildings.

Keywords: *Adaptive Reuse, New additions, Contemporary Additions, Historic Buildings, Preservation.*

1. INTRODUCTION

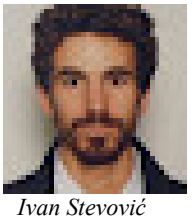
Sustainable construction encompasses three primary dimensions: the economic, environmental, and social facets of the industry's performance[1].Sustainable development is the concept of ensuring an enhanced quality of life for all, aiming to simultaneously attain social, economic, and environmental objectives[2].Building adaptation is considered one of the most effective strategies for sustainability; Adaptive reuse suppliesnew products to the propertymarket, by exchanging old with new functions[3]. Adaptive reuse channels inventive thinking towards utilizing existing resources effectively, contemplating their current availability, and skillfully integrating them into future goals and concepts[4]. Rehabilitation is defined as making possible and compatible reuse for a property by repair, alterations, and additions while preserving those fractions or features that convey itsvalues, ...

THE RELATIVE VALUES OF A MOISTURE PERCENTAGE IN BUILDING ENVELOPES: MOISTURE'S SPOTSWITH A MOISTURE METER

RELATIVNE VRIJEDNOSTI PROCENTA VLAGE U OBLOGAMA ZGRADE: MJESKE VLAGE SA VLAGOMJEROM

Jovana Jovanović[1], Ivan Stevović[2]
[1]Faculty of Civil Engineering and Management, University Union Nikola Tesla, Belgrade, Serbia
[2]Innovation Center, Faculty of Mechanical Engineering, University of Belgrad

Jovana Jovanović



Ivan Stevović

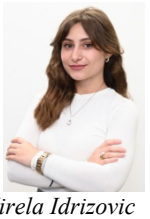
ABSTRACT:
There is a substantial lack of data relating to the hygrothermal traits of existing buildings and building materials. Moisture analysis in building envelopes is 1D (one-dimensional), 2D and 3D effects and feedback can be neglected. Many European standards treat a moisture percentage in building envelopes as surface and interstitial moisture condensation, such as BS EN ISO 10211, BS EN ISO 13788, BS EN ISO 15148, and BS EN 15026. In this manuscript, there was a tendency to capture a relative quantity of superficial moisture, by metering spots on the inner and outer surface of wall lining systems with a moisture meter. The metering specimens were the buildings with different envelopes: a wooden hut-house, a masonry building and a building partially sheeted in stone. The referent heights on wall linings, for taking the moisture data were specified as 50 cm for a wooden and masonry building and 80 cm for a stone-sheeted building, from the ground. The several conclusions were brought. The buidling's envelope is much influenced by the weather. The outer material surface in a shadow can possess a slight moisture quantity. ...
Keywords: *hygrothermal traits, moisture percentage, wall lining systems, moisture meter, building envelope.*

REZIME:
Postoji znatan nedostatak podataka koji se tiču higrotermalnih odlika postojećih zdanja i građevinskih materijala. Analiza vlage u omotačima objekata je 1D (jednodimenzionalna), 2D i 3D efekti i njihove povratne informacije mogu biti zanemarene. Mnogi Evropski standardi tretiraju procenat vlage u omotačima objekata kao površinsku i međuspojnu kondenzaciju vlage, kao što su standardi: BS EN ISO 10211, BS EN ISO13788, BS EN ISO 15148 i BS EN 15026. U ovom članku, težilo se ka tome da se zahvati relativna količina površinske vlage, mjereći tačke na unutrašnjoj i spoljašnjoj površini zidnih obloga sa mjeračem vlage. Mjerni uzorci su bili objekti sa različitim omotačima: drvena koliba (kućica), zidana zgrada i zgrada djelimično prekrivena kamenom. Referentne visine na zidnim oblogama, za uzimanje podataka o vlazi, su bile specificirane kao 50 cm za drvenu i zidanu zgradu i 80 cm za zgradu prekrivenu kamenom, od tla. Nekoliko zaključaka je donešeno. Na omotač objekta u velikoj mjeri utiče vrijeme. Spoljašnja površina materijala u sjenci može posjedovati neznatnu količinu vlage. ...
Ključne riječi: *higrotermalne odlike, procenat vlage, zidne obloge, mjerač vlage, omotač objekta.*

HOW WELL DOES BOSNIA AND HERZEGOVINA FOLLOWS THE REGULATIONS FOR PLANNING HYDROPOWER PLANTS IN RELATION TO THE EU AND ITS REGION?

KOLIKO BOSNA I HERCEGOVINA PRATI PROPISE ZA PLANIRANJE HIDROELEKTRANA U ODNOSU NA EU I NJEZIN REGION?

Mirela Idrizovic[1], Ahmed El Sayed[2]
[1]Master Student, Faculty of Engineering, Natural and Medical Science, International Burch University, Ilidza, Bosnia and Herzegovina



Mirela Idrizovic

Ahmed El Sayed

ABSTRACT:
In this paper, The Design Rules as well as the construction practices in B&H are contrasted with those in other nations in the region and with EU practice in order to establish whether or not such claims are relevant. This paper aims to investigate whether the design and construction regulations of Hydropower plants in Bosnia are aligned with the EU and regional regulations and practices. Also, in the end, examples of hydroelectric power plants that were called out as being built against the law were considered, and analyzed, and discussed. Qualitative comparative Research Methodology was used in this paper and is based on an in-depth analysis of existing regulations in the first stage, and analysis of case studies of built Water Power Plants in the second stage. The findings of the study show that Bosnia and Herzegovina does not have any hydropower plants built in protected areas. As far as laws and regulations are concerned, EU countries have stricter laws and definitions of protected areas, but B&H still has the lead in the countries of the region when it comes to categories of protected areas.

Keywords:*Bosna and Herzegovina, hydropower plant, renewable energy source, EU, hydropower potential, dam, protected areas, sustainability*

REZIME:
U ovom radu Pravila projektovanja kao i građevinske prakse u BiH suprotstavljaju se onima u drugim zemljama u regionu i praksi EU kako bi se utvrdilo da li su takve tvrdnje relevantne ili ne. Ovaj rad ima za cilj istražiti da li su propisi za projektovanje i izgradnju hidroelektrana u BiH usklađeni sa EU i regionalnim propisima i praksom. Također, na kraju su razmotreni, analizirani i diskutovani primjeri hidroelektrana koje su prozvane da su izgrađene protiv zakona. U radu je korištena kvalitativna uporedna metodologija istraživanja koja se zasniva na dubinskoj analizi postojeće regulative u prvoj fazi i analizi studija slučaja izgrađenih HE u drugoj fazi. Nalazi studije pokazuju da Bosna i Hercegovina nema izgrađene hidroelektrane u zaštićenim područjima. Što se tiče zakona i propisa, zemlje EU imaju strožije zakone i definicije zaštićenih područja, ali BiH i dalje vodi u zemljama regiona kada su u pitanju kategorije zaštićenih područja.

Ključne riječi:*Bosna i Hercegovina, hidroelektrana, obnovljivi izvori energije, EU, hidroenergetski potencijal, brana, zaštićena područja, održivost*

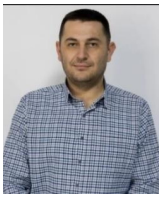
APPLICATION OF NEW TECHNOLOGIES IN SOCIAL MEDIA ANALYTICS

PRIMJENA NOVIH TEHNOLOGIJA U ANALITICI DRUŠTVENIH MREŽA

Mersid Poturak[1], Engin Obucic[1], Dino Keco[2], Ensar Mekic[1]
[1]Faculty of Economics and Social Sciences, Department of Management, International Burch University, Sarajevo, Bosnia and Herzegovina
[2]Faculty of Engineering, Natural and Medical Sciences, Department of Information Technology, International Burch University, Sarajevo, Bosnia and Herzegovina


Mersid Poturak


Engin Obucic


Dino Keco


Ensar Mekic

ABSTRACT:
This study investigates the Social Media Predictive Analytics Theory in Higher Education Institutions (HEIs), focusing on predicting user engagement with Facebook post images at leading universities in Australia, the UK, and the USA. By integrating the Google Cloud Vision API with image features from graphic design and photography literature, the study develops a novel approach for social media image analysis and prediction. The research illuminates the dynamics of image engagement on Facebook, providing pragmatic guidance for global universities to optimise their social media strategies.

Keywords: *Universities, Facebook, image features, user engagement, predictive analytics, cross-country analysis, social media strategies, multiple regression*

REZIME:
Ovo istraživanjese bavi područjem prediktivne analitike društvenih mreža, a u kontekstu visokoobrazovnih institucija.Poseban akcenat se stavlja na predviđanjeuspjeha korisničke interakcije na društvenoj mreži Facebook u sklopu vodećihuniverziteta u Australiji, Velikoj Britaniji i Sjedinjenim Američkim Državama. Koristeći Google Cloud Vision API u kombinaciji sa literaturom o grafičkom dizajnu i fotografiji, razvijena je inovativna metodološka sinteza za analizui predikciju uspjeha vizuala. Ovo istraživanje pruža dragocjen uvid u dinamiku korisničke interakcije savizualima,nudeći praktične savjete univerzitetima širom svijeta za poboljšanjei optimizaciju strategija na društvenim mrežama.

Ključne riječi: *Univerziteti, Facebook, karakteristike vizuala, korisnička interakcija, prediktivna analitika, međudržavna analiza, strategije društvenih mreža, multiplaregresija*

DIGITAL TECHNOLOGIES IN THE BIH BANKING INDUSTRY – STATE AND PERSPECTIVE

DIGITALNE TEHNOLOGIJE U BANKARSKOJ INDUSTRIJI U BIH – STANJE I PERSPEKTIVE

Abdić Adem[1*], Rovčanin Adnan[1], Abdić Ademir[1] and Kanlić Fahir[2]
[1]School of Economics and Business, University of Sarajevo, Bosnia and Herzegovina
[2]Agency for statistics of BiH, Sarajevo, Bosnia and Herzegovina


Adem Abdić


Rovčanin Adnan


Ademir Abdić


FahirKanlić

ABSTRACT:
Financial and technological innovations over the last several decades in the banking industry have underpinned the emergence of new business models, strategies, processes, products, and applications. Furthermore, new entrants into the banking sector, providing financial services, have changed the dominant operating business models and competitive dynamics of the banking industry. The main purpose of this paper is to explore and analyze the state and perspectives of digital technologies application adoption in the banking sector, with a specific focus on bank risk management and supply services. In the paper, key drivers, challenges and benefits of digital technologies/innovations, market participants as well as key application areas in the banking industry are identified. The primary source of data in the research was collected through a structured questionnaire. The target population in the research consists of all banks that operated in the territory of BiH at the end of September 2023.

Keywords:*Banking industry, Digital technology, Financial innovations, Financial services, BiH*

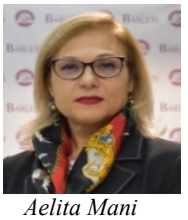
REZIME:
Finansijske i tehnološke inovacije tokom posljednjih nekoliko decenija u bankarskoj industriji podržale su pojavu novih poslovnih modela, strategija, procesa, proizvoda i aplikacija. Osim toga, novi ulaznici u bankarski sektor, pružajući finansijske usluge, promijenili su dominantne poslovne modele i konkurentske dinamike u bankarskoj industriji. Glavni cilj ovog rada je istražiti i analizirati stanje i perspektive usvajanja digitalnih tehnologija u bankarskom sektoru, sa posebnim fokusom na upravljanje rizikom i pružanje usluga snabdijevanja. U radu su identifikovani ključni pokretači, izazovi i beneficije digitalnih tehnologija/inovacija, učesnici na tržištu, kao i ključna područja primjene u bankarskoj industriji. Primarni izvor podataka u istraživanju prikupljen je putem strukturiranog upitnika. Ciljna populacija u istraživanju obuhvata sve banke koje su poslovale na teritoriji BiH krajem septembra 2023. godine.

Ključne riječi: *Bankarska industrija, digitalna tehnologija, finansijske inovacije, finansijske usluge, BiH*

THE POTENTIAL OF THE GREEN ECONOMY AS A MEANS OF FINANCIAL AND PROMOTION GREEN INNOVATION. ALBANIA´S PREDICAMENT

Adriana Xhuveli[1], Aelita Mani[2]
[1]South-East European University, Tetovo, RNM
[2]Head of Department of Economics, Entrepreneurship and Finance“Barleti University”, Albania


Adriana Xhuveli


Aelita Mani

ABSTRACT:
This study explores the green economy's potential as a financial resource for green innovation in Albania. This study seeks to enhance business and other stakeholders' understanding of the European Union's "Green Deal's" new strategic approach and the opportunities and difficulties that arise in the transition to a sustainable development and green economy. This research has tested various aspects of the new reality of living, developing, and doing business. These include the financial mechanisms that are currently set forth and provided, as well as the ones that have been utilized for the achievement of green objectives; the readiness and potential of businesses for green innovation; the identification of gaps and needs for incentive mechanisms in green financing; and the socio-economic impacts observed from a comparative analytical perspective for Albania and the Member States of the European Union.Methodological regression analyses using multi-structural equation models have been established in this regard. The study's findings demonstrate that consumer behavior and the number of applications for green investments and innovations benefit from creating and disseminating "smart" communication strategies and "green" guides, which are intended to inform, educate, and assist businesses in adopting green innovation.

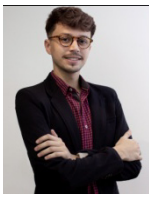
Keywords: *green economy, innovation, smart business, impact, sustainable development*

1. INTRODUCTION

Either macroeconomic or microeconomic growth can benefit from the Green Transition. Developing social awareness and conserving natural resources enhance economic expansion and satisfaction in society. The concept of "green innovation " incorporates philosophy and economics themes about environmental sustainability [1;2]. Nowadays, the subject of climate change is frequently investigated. The seriousness of the situation worries governments and the global populace in addition to marketing researchers who have set ambitious goals: ensuring that businesses succeed without disregarding the environmental factor and proactively educating and influencing clients to lead healthier lives[3].

INVESTMENT DECISION MAKING USING FUZZY LOGIC AND AHP

Lucas Matheus Ribeiro[1], Selma Oliveira[1]
[1]Fluminense Federal University, Volta Redonda, Rio de Janeiro, Brazil
Institute of Human and Social Sciences/Department of Accounting



Lucas Ribeiro

Selma Oliveira

ABSTRACT:
The purpose of this article is to provide an application of a fuzzy logic model in conjunction with AHP to mitigate the uncertainty associated with the economic-financial analysis of companies in the cyclical consumption sector in Brazil, expanding the scope of accounting information, and helping managers in making investment decisions. Experts have judged companies based on indicators from specialized literature. Fuzzy logic was used to manage with the valuation of the uncertainty and the AHP method was used to rank companies based on Liquidity, Indebtedness and Profitability criteria. This approach provides a tool to assist managers in decision making. The interpretation of indicators through the fuzzy inference system and selection of alternatives is capable of providing decision support, dealing with the uncertainty of the decision-making process. This work contributes with knowledge in decision-making support systems. This research brings significant contributions: (i) it improves the quality of information under uncertainties and unpredictability; as is the case with investment decisions; and (ii) sheds light on managers and stakeholders in their economic-financial decision-making journeys; and (iii) signals the prominence of intelligent systems to support complex decisions. It is recommended to collect data from more experts in judging the criteria of importance.

Keywords: *Decision-making, investments, uncertainties, framework, fuzzy-logic, AHP, cyclic consumer sector in Brazil*

1. INTRODUCTION

Investment decision making by individual investors is of interest to many researchers. When making decisions, investors look for quantitative and qualitative information [1], as they affect stock returns [2]. Individual investment decisions are affected by different factors, which creates uncertainty. Supporting useful information for the decision-making of its users is the objective of accounting. This presupposes efficient mechanisms to guarantee the quality of this information. According to [3], reliable accounting information facilitates shareholder monitoring. Following this analogy, [4] states that financial information has two informational roles: to facilitate the selection of investments and the alignment of interests between executives and investors.

INDUSTRY 4.0 WITHIN POSTGRADUATE BUSINESS EDUCATION IN BOSNIA AND HERZEGOVINA: OVERVIEW AND RECOMMENDATIONS

INDUSTRIJA 4.0 U OKVIRIMA POSLIJEDIPLOMSKOG POSLOVNOG OBRAZOVANJA U BOSNI I HERCEGOVINI: PREGLED I PREPORUKE

Munira Šestić[1], Mirha Bičo Ćar[1], Sabina Đonlagić Alibegović[2], Dženan Kulović[3]
[1]University of Sarajevo, School of Economics and Business, Bosnia and Herzegovina
[2]Faculty of Economics, University of Tuzla, Bosnia and Herzegovina
[3] Faculty of Economics, University of Zenica, Bosnia and Herzegovina

Munira Šestić

Mirha Bičo Ćar

Sabina Đonlagić Alibegović

Dženan Kulović

ABSTRACT:
New models of business education strive to harmonize the demands of the labor market with business development trends. Industry 4.0 has irreversibly changed our context and continues to change it, and therefore educational policymakers and lecturers are permanently facing the challenges of creating and implementing curricula that will prepare business students for jobs within the Industry 4.0, both now and in the future. The aim of this paper is to determine the degree of current inclusion of Industry 4.0 in the business postgraduate curricula at three public universities in Bosnia and Herzegovina. In accordance with the findings of the analysis, an overview of the current situation will be given, as a starting point for recommendations to educational policy stakeholders - to more widely accept changes in the context of I4.0, and above all to further improve learning outcomes for postgraduate business students within the Bosnia and Herzegovina.

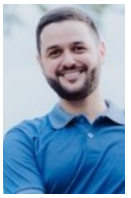
Key words: *Industry 4.0, business education, postgraduate curricula, Bosnia and Herzegovina*

SAŽETAK:
Novi modeli poslovnog obrazovanja nastoje uskladiti zahtjeve tržišta rada sa trendovima razvoja poslovanja. Industrija 4.0 je nepovratno promijenila naš kontekst i nastavlja ga mijenjati, te se kreatori obrazovnih politika i predavači permanentno suočavaju sa izazovima kreiranja i implementacije nastavnih planova i programa koji će pripremiti studente biznisa za poslove u kontekstu Industrije 4.0, kako sada tako i u budućnosti. Cilj ovog rada je utvrditi stepen aktuelnosti poslovnih postdiplomskih nastavnih programa spram zahtjeva Industrije 4.0 na tri javna univerziteta u Bosni i Hercegovini. U skladu sa nalazima analize, dat će se pregled postojećeg stanja, kao polazište za preporuke nosiocima obrazovne politike – na koji način da šire prihvate promjene u kontekstu I4.0, a prije svega da dodatno unaprijede ishode učenja za studente postdiplomskih studija biznisa u Bosni i Hercegovini.

Ključne riječi: *Industrija 4.0, poslovno obrazovanje, postdiplomski kurikulumi, Bosna i Hercegovina*

BIG DATA ANALYTICS IN GOVERNMENT ORGANIZATIONS IN AN EMERGING ECONOMY

Giulliano Delgado[1], Selma Oliveira[1]
[1] Fluminense Federal University, Volta Redonda, Rio de Janeiro, Brazil
Institute of Human and Social Sciences/Department of Accounting


Giulliano Delgado


Selma Oliveira

ABSTRACT:
The literature on the diffusion of analytical big data rarely provides empirical evidence in government institutions in emerging economies. In this article, we test a research framework capable of capturing the barriers related to the adoption of analytical big data in government institutions in Brazil. Using a survey, primary survey-based data was collected from different IT professionals in Federal Public Institutions, etc. The results of our survey cover both expected and unexpected results: (i) unexpectedly, in this survey, dynamic digital capabilities are the most prominent barriers; (ii) intangible analytical capabilities do not represent a substantial barrier; and (iii) the adoption of analytical big data by Brazilian federal government institutions does not hamper the analytical capabilities of big data and digital dynamic capabilities, but motivated by other factors to be investigated. This study is original and makes contributions to the theory and practice of management.

Keywords: *barriers to analytical big data adoption, government institutions, emerging economy.*

1. INTRODUCTION

The prestigious literature [1] highlights the relevance of emerging technologies to improve the results of organizations. While the potential benefits of digital technologies have been widely publicized [2, 3, 4], little is known about governments digitally enabled by big data analytics in emerging economies. Based on the contemporary debate on analytical big data, this study examines the barriers related to the adoption of this tool in Brazilian government institutions. Understanding the inhibitors to the adoption of big data analytics in government institutions is important for several reasons, for example:Analytical big data facilitates innovation [5], offers opportunities to understand trends and behaviors that were previously not possible [6], improves decision-making [7], creates strategic value [8, 9], creates value in interorganizational relationships [10], and allows improving the quality of decision-making through data analysis resources [11]. We believe these benefits can be leveraged by government organizations.
...

SUSTAINABLE PEACEBUILDING AND RESPONSABILE USE OF TECHNOLOGY AS MEANS AND CONSENQUENCES OF ARMED CONFLICTS IN INTERNATIONAL HUMANITARIAN LAW

***Pjereta Agalliu*[1]**
[1]*Department of Public Law, Faculty of Law, University of Tirana, Albania*

Pjereta Agalliu

ABSTRACT
The current paper addresses the role of sustainable peacebuilding and use of technology in the context of armed conflicts in international humanitarian law. The background of the study is rooted in the Charter of the United Nations, which prohibits the use of force in international relations, but acknowledges the need for norms to mitigate its impact through the responsible and good use of technology. The aim of the study is to examine the application of technological advancement in international humanitarian law norms to mitigate armed conflicts and their consequences. The methodology employed in this study involves a review of relevant literature on international humanitarian law, armed conflicts, and technological progress. The research context is global, with a focus on European states and the European Union. The findings indicate that the application of good technology in international humanitarian law norms is crucial in preventing unnecessary violence and suffering in armed conflicts. The paper highlights the importance of responsible technological use and respecting the international norms to lay the foundation for a peaceful resolution post-conflict. The implications of this study are significant, as utilizing good technology in respecting international humanitarian law can contribute to the minimization of armed conflicts and the promotion of lasting peace.

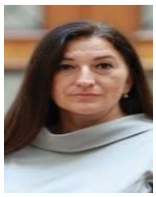
Keywords: *sustainable peacebuilding, technology, armed conflicts, international humanitarian law, human dignity*

INDUSTRY 4.0 IN MICRO, SMALL AND MEDIUM SIZED ENTERPRISES OF THE SARAJEVO CANTON

INDUSTRIJA 4.0 U MIKRO, MALIM I SREDNJE-VELIKIM PREDUZEĆIMA KANTONA SARAJEVO

Mirha Bičo Ćar[1], Isak Karabegović[2], Munira Šestić[1], Elvir Šahić[1], Selma Hodžić[3], Savo Stupar[1]

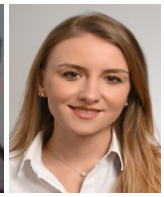
[1]University of Sarajevo, School of Economics and Business, Bosnia and Herzegovina
[2]The Academy of Sciences and Arts of Bosnia and Herzegovina, Sarajevo
[3]Uniqa osiguranje, Sarajevo, Bosnia and Herzegovina


Mirha Bičo Ćar


Isak Karabegović


Munira Šestić


Elvir Šahić


Selma Hodžić


Savo Stupar

ABSTRACT:
The paper examines the practice of implementing Industry 4.0 in micro, small and medium-sized enterprises, with a special focus on the representation of these technologies in Bosnia and Herzegovina, Sarajevo Canton. The research conducted in 2023 showed that micro, small and medium-sized enterprises in Sarajevo Canton first adopt those I 4.0 technologies that are more affordable and easy to master the knowledge for their use. Further implementation of I4.0 technologies in micro, small and medium-sized enterprises in Sarajevo Canton is essentially determined by the support of institutions through appropriate educational programs, as well as the establishment of an appropriate cyber-physical environment that will support this ecosystem.

Key words: *Industry 4.0, basic technologies, micro, small and medium-sized enterprises, Sarajevo Canton, Bosnia and Herzegovina*

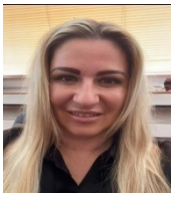
SAŽETAK:
U radu se istražuje praksa implementacije Industrije 4.0 u mikro, malim i srednje-velikim preduzećima, sa posebnim fokusom na zastupljenost ovih tehnologija u Bosni i Hercegovini, Kantonu Sarajevo. Istraživanje provedeno tokom 2023. godine, pokazalo je da mikro, mala i srednje-velika preduzeća u Kantonu Sarajevo najprije usvajaju one tehnologije I 4.0 koje su dostupnije cjenovno i lakoćom ovladavanja znanjem za njihovu upotrebu. Dalje implementiranje tehnologija I4.0 u mikro, mala i srednje-velika preduzeća u Kantonu Sarajevo bitno je određeno podrškom institucija kroz odgovarajuće obrazovne programe, kao i uspostavljanjem odgovarajućeg cyber-fizičkog okruženja koje će podržavati ovaj ekosistem.

Ključne riječi: *Industrija 4.0, Itemeljne tehnologije, mikro, mala i srednje-velika preduzeća, Kanton Sarajevo, Bosna i Hercegovina*

SOCIAL MEDIA AND MARKETING WORLDWIDE

Branislav Dudić[1,2], Alexandra Mittelman[1], Jaroslav Vojtechovský[1]
[1]Comenius University Bratislava, Faculty of Management, Bratislava, Slovakia
[2]University Business Academy, Faculty of Economics and Engineering Management, Novi Sad, Serbia


Branislav Dudić


Alexandra Mittelman


Jaroslav Vojtechovský

ABSTRACT:
Social networks are one of the most used medium of the internet marketing communication, by means of which companies influence thedecision making in consumer behaviour of the big group of people around the world. Social neworks have become by gradual technological progress very important medium in the field of marketing communication of companies operating in all sectors of economy. Social networks are able to influence big amount of people in short time and new product that is introduced will become worldwide known. The expression digital marketing is connected to the newest information technologies as following: computer and mobile communication. Facebook, Youtube, WhatsApp, Instagram etc.. belong among the most used social networks.

Keywords: *marketing, social media, consumer behaviour, digital marketing, communication.*

1. INTRODUCTION

Nowadays, almost the whole world is operating online what means that the popularity of digital marketing is growing every day. Online marketing is getting used more and more among other traditional marketing tools. Social networks are one of the most used media of the internet marketing communication by means of which companies influence decision making in consumer behaviour of the big group of people around the world. New trends have been constantly developing in online marketing environment what brings their new opportunities how to succeed on the market and therefore it is important for the society to keep in touch with time. Social networks marketing has become more and more popular. People spend more time just in online world. Social networks have caused the revolution in the use of internet. The social networks formation was connected to entertainment, free time and connection with new people. Nowadays, social networks are connected mainly to the digital marketing plan and brand strategy for companies. The presence of companies on social networks brings many advantages for consumers. Thanks to them, companies are able to promote their products, connect with customers and follow their interests.

HOW IS THE USE OF ICT SHAPING OUR INTENDED EFFORT FOR LEARNING?

KAKO UPORABA IKT-A OBLIKUJE NAŠU NAMJERU ZA UČENJEM?

Fiser Zrinka
Department of Social Sciences and Humanities EDUDpt,
University of Slavonski Brod, Slavonski Brod, Croatia

Zrinka Fiser

ABSTRACT:
During COVID-19 pandemic, students of all educational levels were forced to transition from face-to-face to online learning setting which necessitated the use of ICT and different learning platforms such as Zoom, Microsoft Teams or Google Meet. During the 2022/2023 academic year, 279 non-English major students at the University of Slavonski Brod in Croatia participated in a study to determine the effect of online learning experience on the process of learning English as a foreign language (EFL). Kendall's tau-b, Mann-Whitney U, and t-tests revealed a strong positive correlation between intended effort and the experience of online learning during tertiary education. The instrument used in the research has not yet been applied in the context of postpandemic Croatian universities, so the findings represent a frontier in exploring the influence of using ICT in formal learning of EFL.

Keywords:*ICT, pandemic, intended effort, online learning, students.*

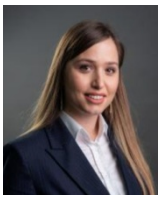
REZIME:
Tijekom pandemije COVID-19 učenici svih obrazovnih razina bili su prisiljeni prijeći s učenja u 'face-to-face' učenja na učenje u 'online' okruženju, što je zahtijevalo upotrebu IKT-a i različitih platformi za učenje kao što su Zoom, Microsoft Teams ili Google Meet. Tijekom akademske godine 2022./2023. u istraživanju je sudjelovalo 279 studenata nejezičnog smjerasa Sveučilišta u Slavonskom Broud u Hrvatskoj kako bi se utvrdio učinak iskustva 'online' učenja na proces učenja engleskog kao stranog jezika (ESJ). Kendall tau-b, Mann-Whitney U i t-testovi otkrili su snažnu pozitivnu korelaciju između namjeravanog napora i iskustva 'online' učenja tijekom tercijarnog obrazovanja. Instrument korišten u istraživanju još nije primijenjen u kontekstu postpandemijskih hrvatskih sveučilišta, pa nalazi predstavljaju novost u istraživanju utjecaja korištenja IKT-a u formalnom učenju ESJ-a.

Ključne riječi: *IKT, pandemija, namjeravani napor, 'online' učenje, studenti.*

CONTEMPORARY MIGRATIONS AND DEVELOPMENT DYNAMICS

Marija Orlandic[1], Marija Radunovic[1], Ivana Katnic[1]
[1]University of Donja Gorica Faculty of International Economics, Finance and Business, Podgorica, Montenegro


Marija Orlandic


Marija Radunovic


Ivana Katnic

ABSTRACT:
The migration of populations has marked human life on planet Earth. Migrations that originated in Ethiopia have never ceased. The pursuit of better living conditions is a growing phenomenon in today's world. It not only about internal migrations within a country from north to south or vice versa but about migrations within the entire planet. The complexity of the concept of international migration is best evidenced by the current global situation. The relationship between migration and development is complexed, because of numerous factors that influence both. What is the correlation between migration and economic development?Do migrations affect development or vice versa? What are the causes of emigration? Do migrations have a negative impact on development?

Keywords: *migrations, development, population*

1. INTRODUCTION

Our pre-ancestor began to move in search of better living conditions, both in terms of sustenance and protection from external conditions. Nomadic life originated from Ethiopia. Hunger has been the driving force of humanity throughout history. [1] Our distant ancestor ingeniously embarked on the conquest of areas that offered better living conditions, primarily protection from external conditions, but also food. Fertile soil and caves were the initial reasons for migration. Nomadic tribes led migrations, followed by the Jews who escaped slavery in ancient Egypt and headed for the Promised Land. Migrations continued with the Ancient Greeks and Romans, who brought slaves from conquered areas to serve in Rome and Greek poleis. This marked the beginning of the mixing of cultures and customs, as well as the first forms of large migrations.

USING THE MAXIMUM ENTROPY METHOD FOR EFFECTIVE PROJECT MANAGEMENT

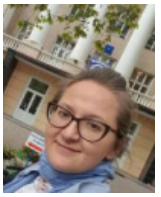
KORIŠĆENJE METODE MAKSIMALNE ENTROPIJE ZA EFIKASNO UPRAVLJANJE PROJEKTOM

Volodymyr Litvinov[1], Liubov Bovnegra[1], Andrey Pavlyshko[1], Alla Toropenko[1], Yuliia Babych[1]
[1]Odessa National Polytechnic University, Odessa, Ukraine


Volodymyr Litvinov


Liubov Bovnegra


Andrey Pavlyshko


Alla Toropenko


Yuliia Babych

ABSTRACT:
The areas of application of the maximum entropy method in project management are considered. The development of a methodology for applying the maximum entropy method to assessing the risks of project implementation is proposed; the capabilities and advantages of the method are shown using an example. It is sown how simple calculations can provide to different conclusions. It is proposed to use a combination of the Monte Carlo method and the maximum entropy method with a preliminary analysis of a small volume of expert data using the maximum entropy method, followed by modeling of a small volume of scenarios and parameters selected at the first stage. This approach allows you to build simple procedures for analyzing project risks and obtain reliable results with a small amount of preliminary information. It is shown that the proposed algorithm is not very sensitive to changes in part of the initial data, that is, it allows the use of low-quality expert data to obtain a stable preliminary result.

Keywords: *Keywords Monte-Karlo, expert, simple, combination, stability.*

REZIME:
Razmatrana su područja primjene metode maksimalne entropije u upravljanju projektima. Predlaže se razvoj metodologije za primjenu metode maksimalne entropije za procjenu rizika implementacije projekta; na primjeru su prikazane mogućnosti i prednosti metode. Posijano je kako jednostavne kalkulacije mogu dati različite zaključke. Predlaže se korištenje kombinacije Monte Carlo metode i metode maksimalne entropije uz preliminarnu analizu malog obima ekspertskih podataka metodom maksimalne entropije, nakon čega slijedi modeliranje malog obima scenarija i parametara odabranih u prvoj fazi. . Ovaj pristup vam omogućava da izgradite jednostavne procedure za analizu rizika projekta i dobijete pouzdane rezultate sa malom količinom preliminarnih informacija. Pokazano je da predloženi algoritam nije previše osjetljiv na promjene dijela početnih podataka, odnosno omogućava korištenje nekvalitetnih stručnih podataka za dobijanje stabilnog preliminarnog rezultata.

Ključne riječi: *Ključne riječi Monte-Karlo, ekspert, jednostavno, kombinacija, stabilnost.*

EFFECTS OF WORK DIGITALIZATION AND HYBRIDIZATION WITHIN THE TAX SYSTEM OF BOSNIA AND HERZEGOVINA

EFEKTI DIGITALIZACIJE I HIBRIDIZACIJE RADA U PORESKOM SISTEMU BOSNE I HERCEGOVINE

Elvir Čizmić[1], Elvir Karajbić[2], Đevad Šašić[3], Rifet Đogić[4]
[1]University of Sarajevo, School of Economics and Business, Bosnia and Herzegovina
[2]Parliament of Federation of Bosnia and Herzegovina Entity
[3]University of Sarajevo, Faculty of Administration-associate member, Bosnia and Herzegovina
[4]University of Zenica, Faculty of Economics, Bosnia and Herzegovina


Elvir Ćizmić


Elvir Karajbić


Đevad Šašić


Rifet Đogić

ABSTRACT:
Hybridization of work is a phenomenon that is more intensively applied with the emergence of digitization and computerization of processes in different types of organizations. Hybridization is a possibility of performing work by managers and employees through temporal, spatial, technological, administrative and innovation differentiation, all in the function of simultaneously improving the satisfaction and performance of all participants in this process. The conceptual framework of the research is modeled in a way that the phenomenon of hybridization is observed in the context of the key components of job design, which includes the working task, the technical system, the task executors,... This paper goal is to recognize the intensity of hybridization and digitalization of this type of work, while measuring their impact on the performances of the executors through their engagement and satisfaction, along with the projection of future guidelines for application of the hybrid work format.
Key words: *Digitization of work, Hybridization of work, Components of workplace, Performance of executors*

SAŽETAK:
Hibridizacija posla predstavlja fenomen koji se intenzivnije aplicira sa pojavom digitalizacije i informatizacije procesa u različitim tipovima organizacija. Hibridizacija se ogleda kao mogućnost obavljanja posla od strane menadžera i zaposlenika kroz vremensku, prostornu, tehnološku, administrativnu i inovacijsku diferencijaciju a sve u funkciji simultanog unapređenja zadovoljstva i učinka svih sudionika u navedenom procesu. Konceptualni okvir istraživanja je modeliran na način da se fenomen hibridizacije posmatra putem observacije njegovog intenziteta kroz ključne komponente koje tvore dizajn radnog mjesta što uključuje radni zadatak, tehnički sistem, izvršioce posla, ... Cilj rada je prepoznati intenzitet hibridizacije i digitalizacije ove vrste posla uz mjerenje njihovog uticaja na učinkvitost izvršilaca kroz njihov radni angažman i zadovoljstvo, uz projekciju budućih smjernicaaplikacije hibridnog formata rada.
Ključne riječi: *digitalizacija posla, hibridizacija posla, komponente radnog mjesta, performanse izvršilaca*

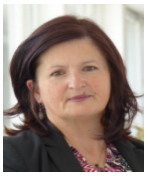
CONTEMPORARY MANAGEMENT TECHNIQUES INTHE FUNCTION OF WORK IMPROVEMENT IN PRIMARY SCHOOLS OF CANTONSARAJEVO

SAVREMENE UPRAVLJAČKE TEHNIKE U FUNKCIJI UNAPREĐENJA RADA U OSNOVNIM ŠKOLAMA KANTONA SARAJEVO

Elvir Čizmić[1], Dženita Čehajić-Kulo[2], Zijada Rahimić[3],Munira Šestić[4]
[1,3,4]Universityof Sarajevo, School of Economics and Business, Bosnia and Herzegovina
[2]Director of Primary School „Srednje“ Ilijaš


Elvir Ćizmić


Dženita Čehajić-Kulo


Zijada Rahimić


Munira Šestić

ABSTRACT:
This paper is focused on the analysis of the causal relationships of the quality of management in primary schools, measured through the application of modern management techniques through time, technology and process management, and the improvement of the functioning quality of primary schools as educational institutions. The assumption stays that connection between efficient time management and the application of modern technologies in schools points to the expectation that managers who apply modern technologies optimize time more efficiently and therefore all processes in the schools. The research was conducted in Sarajevo Canton, and the sample used in the research was a convenience target one. ...
The aim of the work is to test the impact of the use of modern management techniques and digital technologies in the work process of the director on improving the perception of the quality of the functioning of primary schools in Sarajevo Canton.

Keywords: *primary schools, time management, digitization, leadership styles, work improvement*

SAŽETAK:
Ovaj rad je fokusiran na analizu kauzalnih odnosa kvaliteta menadžmenta u osnovnim školama, mjernih kroz primjenu savremenih tehnika menadžmenta kroz upravljanje vremenom, tehnologijom i procesima, i una pređenje kvaliteta fukcioniranja osnovnih škola kao odgojno obrazovnih ustanova. Polazi se od pretpostavke da postoji povezanost efikasnog upravljanja vremenom i primjene savremenih tehnologija u školama upućuju naočekivanje da direktor i koji primjenjuju savremene tehnologije efikasnije upravljaju vremenom a samim timi svim procesima u školi. Istraživanje je provedeno u Kantonu Sarajevo, a uzorak koji je korišten u istraživanju je ciljni prigodni. ...
Cilj rada je testirati uticaj korištenja savremenih tehnika menadžmenta i digitalnih tehnologija u procesu rada direktora na unapređenje percepcije o kvalitetu funkcioniranja osnovnih škola u Kantonu Sarajevo.

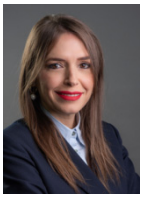
Ključne riječi: *osnove škole, opravljanje vremenom, oigitalizacija, stilovi vođenja, unapređenje rada*

ROOTS OF THE NEW DEVELOPMENT TRENDS IN EUROPE

Marija Radunovic[1], Marija Orlandic[1], Ivana Katnic[1]
[1]University of Donja Gorica Faculty of International Economics, Finance and Business, Podgorica, Montenegro


Marija Radunovic


Marija Orlandic


Ivana Katnic

ABSTRACT:
The world today (still) lives and develops in the era of the dominance of Western culture, the Western value system, and the mode of thinking that originated from European civilization. The political crisis in the European continent underscores the urgent need to reassess this system of values, social, political, and economic systems. Most importantly, this crisis calls for a reconsideration of the respect and understanding of European culture, which, despite numerous challenges, has made it the regional system characterized by the most extensive interconnection, coupled with the highest standard of democratic institutions and living conditions.The roots of European culture, that spiritual adhesive and unifying way of thinking in the Old Continent, have been "sown" for millennia.Therefore, the hypothesis of this work is that the ancient world is a precursor to the dominance of Western culture in today's global order. Accordingly, the unity and uniqueness of Europe can only be maintained by understanding the material and non-material culture of the civilizations from which it emerged. The question that is particularly analyzed to support the hypothesis is why Ancient Greece and Ancient Rome were so influential, and what characteristics set them apart from other civilizations of antiquity to make their influence felt today? Why is this influence so (un)noticeably present today, and what social phenomena has the philosophical thought of Ancient Greece given rise to? Traveling through Europe, we often traverse paths and roads first laid out by the ancient Romans, known as skilled engineers and architects. For centuries, the city-building system established by the Romans has dominated the imagination of Europeans, and a significant number of large European cities were established on those foundations. Why are Greek democracy, Roman law, and the art of the ancient world important for understanding the ways of today's Europeans? These are just some of the question that will be answered in this paper.

Keywords: *new development, roots, economics, civilization, process, Europe*

COMPETENCIES FOR THE 21ST CENTURY: IS EDUCATION KEEPING UP WITH INDUSTRY 4.0?

KOMPETENCIJE ZA 21.STOLJEĆE: PRATI LI OBRAZOVANJE INDUSTRIJU 4.0?

***Zrinka Šimunović*[1], *Višnja Vekić-Kljaić*[1]**
[1]*University of Slavonski Brod, Department of Social Sciences and Humanities, Slavonski Brod, Croatia*

Zrinka Šimunović

Višnja Vekić-Kljaić

ABSTRACT:
New technologies and industrial advancements directly impact the field of education. The research aims to determine the perception of competency for jobs and future areas of work among final-year graduate students at the University of Slavonski Brod in Croatia. Mechanical engineering, economics, eco-engineering, future teachers and preschool teachers were included in the research. Data were collected through online surveys, Students assessed competencies in the areas of creativity, critical thinking, problem-solving, the use of digital technologies, and socio-emotional development. Research results show differences in the perception of competencies among students from different study programs, as well as a general sense of possessing the competencies needed for work in the 21st century. Curriculum innovation and the promotion of lifelong learning are essential elements of education for the future.

Keywords: *adaptation, education, graduates, innovation, lifelong learning*

REZIME:
Nove tehnologije i industrijski napredak društva imaju izravan utjecaj na područje odgoja i obrazovanja. Cilj istraživanja je utvrditi doživljaj kompetentnosti za poslove i buduća područja rada studenata završnih godina diplomskih studija na Sveučilištu u Slavonskom Brodu u Republici Hrvatskoj. U istraživanje su uključeni studenti strojarstva, ekonomije, ekoinžinjerstva, budući učitelji i odgojitelji. Podaci su prikupljeni online istraživanjem. Studenti su procjenjivali kompetentnosti iz područja kreativnosti, kritičkog mišljenja, rješavanja problema, korištenja digitalnih tehnologija i socijalno-emocionalnog područja. Rezultati istraživanja prikazuju razlike u doživljaju kompetentnosti studenata različitih studijskih programa kao i opći osjećaj posjedovanja kompetencija potrebnih za rad u 21. stoljeću. Inoviranje kurikuluma i poticanje cjeloživotnog učenja nužni su elementi obrazovanja za budućnost.

Ključne riječi: *cjeloživotno učenje, diplomanti, inovativnost, obrazovanje, prilagodba*

HOMO DEUS: TECHNOSKEPTICISM/TECHNO-OPTIMISM - SLIPPING INTO THE TECHNOSPHERE

Abdel Alibegović[1], Dina Radeljaš[2], Omar Tahirović[1], Alen Arnautović[1]
[1]Department of Sociology, Faculty of Political Sciences, University of Sarajevo, Sarajevo, Bosnia and Herzegovina
[2]Public and Human Services Department, Mohawk Valley Community College- PH353


Abdel Alibegović


Dina Radeljaš


Omar Tahirović


Alen Arnautović

ABSTRACT:
Contemplating the future of human evolution and understanding the role of technology in shaping our destiny inevitably borders on technoskepticism and/or techno-optimism as two specific perspectives that, individually and together, arise from the accelerated technological dynamics. It is essential to point out the fundamental starting points or foundations based on which we can speak about our perception of the technological moment. What significantly and decisively dictates the overall mechanization of our world, first and foremost, involves the rapid development of artificial intelligence, advances in biotechnology, automation, and other technological innovations. Is it justified to affirm the narrative about the brighter sides of technology and how technological innovations can contribute to human evolution? The phrase "slip into the technosphere" suggests the open possibility of a gradual or unexpected transition of human civilization into the sphere of pervasive/comprehensive technology, opening the door to discussions about the balance between technological progress and human well-being.
Keywords: Homo Deus, Technosphere, Technoskepticism, Techno-optimism, Future of human evolution, Technological Abyss.

1. INTRODUCTION

We consider every effort to contemplate the future of human evolution thoughtfully, profoundly, and comprehensively, with a particular focus on the role of technology in shaping that future, extremely important. One of the significant questions, against the backdrop of necessary reflections on the future of our world, is: can technology enhance human life, life in general, and address global challenges? To understand the complexity of the relationship between technology and human evolution, it is useful to introduce the discussion and perspectives of both techno-optimism and techno-skepticism. Techno-skepticism emphasizes a certain doubt and concern about the complexity of challenges associated with rapid technological progress, such as the fear/dilemma of job loss due to automation, ethical dilemmas regarding the scope and consequences of the rapid development of biotechnology, nanotechnology, or concerns about privacy, ...

TECHNOLOGY AND TEMPORALITY - ACCELERATED HISTORY OF THE WORLD

TEHNOLOGIJA I TEMPORALNOST - UBRZANA POVIJEST SVIJETA

Halima Sofradžija[1], Abdel Alibegović[1], Amina Hodžić[1], Miroslav Pisarević[1]
[1]Department of Sociology, Faculty of Political Sciences, University of Sarajevo, Sarajevo, Bosnia and Herzegovina


Halima Sofradžija


Abdel Alibegović


Amina Hodžić


Miroslav Pisarević

ABSTRACT:
Authors seek to illuminate the cause-and-effect relationship between technological progress and the perception of space and time. One of the problematic questions in this research is: How do modern technologies shape our experience of the world? In the accelerated history of the world, in the new dromological dynamics, Homo sapiens experiences the overall character of the changing way we perceive space and time. Can technological acceleration be recognized as a kind of "Moloch of modernity" or a source of long-term uncertainty, or as a promising potential/liberating force? The new science, dromology, seeks to analyze the impact of speed on our overall interactions, social processes, in a holistic manner. Are we witnessing a new paradigm of space and time? Technological Rationality, Digital Insecurity, Fluid and Temporally Transparent Identities are just segments in a world that is rapidly and irreversibly technicizing.

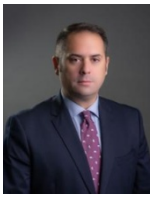
Keywords: *Acceleration, Dromology, Digital Insecurity, Temporally Transparent Identities, Accelerated History of the World*

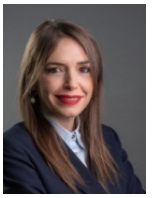
SAŽETAK:
Autori nastoje osvijetliti uzročno-posljedičnu povezanost između tehnološkog napretka i percepcije prostora i vremena. Jedno od problemskih pitanja u ovom istraživanju jeste: Kako savremene tehnologije oblikuje naše iskustvo svijeta života? U ubrzanoj povijesti svijeta, u novoj dromološkoj dinamici svijeta Homo Sapiens iskušava sveukupni karakter mijenjajućeg načina na koji doživljavamo prostor i vrijeme. Može li tehnološko ubrzanje biti prepoznato kao svojevrsni „Moloh modernosti“/izvor dugoročne nesigurnosti ili obećavajući potencijal/izbavljajuća sila? Nova znanost, dromologija, nastoji u holističkom maniru analizirati uticaj brzine na naše sveukupne interakcije, društvene procese, općenito. Svjedočimo li novoj paradigmi prostora i vremena? Tehnološka racionalnost, digitalna nesigurnost, fluidni i temporalno prozirni identiteti samo su segment u svijetu koji se ubrzano i nepovratno svetehnizira.

Ključne riječi*: Ubrzanje, Dromologija, Digitalna nesigurnost, Temporalno prozirni identiteti, Ubrzana povijest svijeta.*

ECONOMIC POWER: SECURITY, MILITARY AND POLITICAL RESOURCE

Ivan Jovetic[1], Ivana Katnic[1]
[1]Faculty for International Economy, Finance and Business University of Donja Gorica, Podgorica, Montenegro


Ivan Jovetic


Ivana Katnic

ABSTRACT:
Economic power impacts all other forms of power, primarily military and political. Moreover, history of civilizations is actually history of interrupted wars. It seems, respectively, that quest for wealth, money and life quality has been the engine of technological, military and historical processes. Economic wealth and in particular quest for it (re)shaped technological and military power but also the war and its forms. Capitalism as the system enabled respective even more as it networks science, industry and military technology. The economy (re)shapes technology and research while they impact advances in technology and trade which form political-military power. Consequentially, aforementioned (re)shapes also the notion, context as well as security itself. Economy should be seen as the security resource in both directions.

Keywords: *economic power, military power, technology, security, economy, resource*

1. INTRODUCTION

Money driving the world is an old and resistant idea.[1] In case of accepting such premise it further means that money drives wars and leads to „successful“ creation of more money, more resources and more wealth. In other words, economic power impacts all other forms of power, primarily military and political. As Ferguson states, Bradford DeLong concludes that economic change is the engine of history. Ferguson is in line with some of the thoughts of Eric Hobssbaum. If we add thesis made by Botul and Vukotic that history of civilizations is actually history of interrupted wars i.e., fight with hunger, it seems that quest for wealth, money and life quality has been the engine of technological, military and historical processes. DeLong's thesis has been further developed and as Ferguson considers towards three of the most important hypothesis: (i) economic growth improves democracy; (ii) economic success provides re-election and (iii) economic growth and development are the key for international power as Kennedy himself defined.

B2B E-COMMERCE IN EUROPE

Branislav Dudić[1,2],Velibor Spalević[3]
[1]Comenius University Bratislava, Faculty of Management, Bratislava, Slovakia
[2]University Business Academy, Facultyof Economics and Engineering Management, Novi Sad, Serbia
[3]University of Montenegro, Biotechnical Faculty, Podgorica, Montenegro

Branislav Dudić

Velibor Spalević

ABSTRACT:
Nowadays, electronic commerce has created many opportunities not only for companies but also for consumers. E-commerce is used a lot today and it is assumed that its use will increase in the future as well. Companies use e-commerce in order to sell their products or services and generate as much profit as possible. Business-to-business (B2B) – describes the electronic exchange of products, services and information between businesses. B2B operation refers to business transactions between businesses, such as manufacturers selling to distributors, wholesalers selling to retailers, or companies providing services to other companies. In the future, around 85% of B2B sales interactions between suppliers and buyers will take place in digital channels.

Keywords: *e-commerce, business-to-business (B2B), marketshare, development.*

1. INTRODUCTION

E-commerce is divided into several types that work differently. However, each type of e-commerce works using the global Internet network and using devices such as: computer, mobile or tablet. Internet shopping is gaining popularity in the modern world, and people feel more and more compliant and secure when shopping online. Online shopping provides more information to compare prices and products, more variety and also brings satisfaction to modern customers who are looking for speed of shopping. The term e-commerce is used as part of business activities.E-commerce has become an increasingly important source of competitive advantages for business-to-business (B2B) companies[1]. In e-commerce, a very important factor of analysis is the economic development of B2B and B2C models on the electronic market with a more specific breakdown of their sales shares worldwide. At the same time, these models analyze the market of e-commerce sales and the share of total e-commerce as one of the ways of mediating orders, defining a significant influence on sales and consumer preferences for making purchases.

ANALYTICAL REVIEW OF THE CURRENT STATE OF THE RUSSIAN ECONOMY AND ITS VARIOUS INDUSTRIES

Irina Somina[1], Maxim Kondakov[1]
[1]Belgorod State Technological University named after V.G. Shukhov, Institute of economics and management, Belgorod, Russia


Irina Somina


Maxim Kondakov

ABSTRACT:
The article considers the current state of the economy of the Russian Federation, for which the pandemic became a factor that required certain adjustments to the plans of socio-economic and political development. The impact and consequences of the crisis of 2020 caused by the coronavirus epidemic are analyzed. The reasons for the rapid recovery of the country's economy are given. At this point in time, the key issues facing the Russian economy correspond to the issues facing all developed countries. The changes made by the Central Bank and the Government of Russia in the period from 2021 to stabilize the economy are disclosed. The dynamics of development of certain sectors of the national economy due to the impact of a number of macroeconomic challenges is presented. Noteworthy for the current conditions, i.e. under the imposed sanctions and the crisis, is the stable exports and high investments. The forecasts of various experts and institutions regarding the results of 2023 in terms of the development of the Russian economy are presented. The structure of GDP by sectors of the economy is shown. It is substantiated that the construction industry can become one of the key drivers of the Russian economy development. The current state of the construction industry of the Russian Federation and related industries, as well as the prospects for their development are analyzed. Actions to improve the sustainability of the construction industry and individual branches of the industrial complex are proposed. In the conclusion of this article the further prospects for the development of the economy of the Russian Federation are determined.

Keywords: *economy of the country, analytical review, construction industry, industry, Russian Federation, global economy*

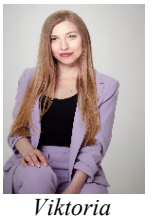
USE OF ARTIFICIAL INTELLIGENCE IN THE FORMATION OF THE MARKETING STRATEGY OF THE ENTERPRISE

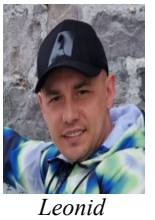
Chukurna Olena[1], TardaskinaTetiana[2], AlkhimovaVioleta[3], KofmanViktoria[4], Pankovets Leonid[5]
[1,2,3,4,5]State University of Intelligent Technologies and Telecommunications, Faculty of Business and Social Communications, Odessa, Ukraine


Olena Chukurna


Tetiana Tardaskina


Violeta Alkhimova


Viktoria Kofman


Leonid Pankovets

ABSTRACT:
This paper presents the resultsstages of a marketing strategy where various artificial intelligence tools can be employed. A comprehensive analysis of using artificial intelligence tools in shaping a company's marketing strategy indicates its significant impact and prospects in the marketing domain. Integrating artificial intelligence into marketing processes enables businesses to enhance the level of personalization in offerings to customers, automate competitive analysis processes, and respond quickly to changes in the market environment. The research concludes that the use of machine learning algorithms allows businesses to optimize advertising campaigns, forecast demand, and determine optimal pricing strategies. The study results in the introduction of the profession of an AI marketer, which can be considered a transformation of the traditional marketing profession in the context of utilizing artificial intelligence and other digital technologies.

Keywords: *Artificial Intelligence, marketing strategy, digital transformation, artificial intelligence tools, AI-marketer.*

1. INTRODUCTION

Fundamental Artificial Intelligence (AI) technologies are designed to facilitate the transformation of the economy, the labor market, governmental institutions, and society as a whole. The use of AI technologies will provide significant opportunities to enhance production efficiency, reduce costs, and improve the quality of goods and services.The growth of data volumes, the development of new types of sensors, and the decreasing cost of computing power create conditions for the further advancement of Artificial Intelligence technologies [4].

The development of AI technologies is an integral part of the Fourth Industrial Revolution, also known as «Industry 4.0». Industry 4.0 involves the implementation of automated production processes that utilize the Internet of Things (IoT), ...

MAJOR CHALLENGES IN THE CONSTRUCTION INDUSTRY

GLAVNI IZAZOVI GRAĐEVINARSTVA

Ivana Domljan [1], Vjekoslav Domljan[2]
[1]University of Mostar, Faculty of Civil Engineering, Architecture and Geodesy, Mostar, Bosnia and Herzegovina
[2]Sarajevo School of Science and Technology, Sarajevo, Bosnia and Herzegovina

Ivana Domljan

Vjekoslav Domljan

ABSTRACT:
In the global economy, currently confronting environmental, regulatory and other challenges, the construction industry is one of its large stones, embracing 10-12 % of the global economy. This paper examines the major challenges that the construction industry is currently experiencing: a severe labour shortage and low productivity. Although progress in certain industries has been significantly influenced by recent advances in artificial intelligence, the construction industry has slowly responded despite experiencing labour shortages and slowly increasing productivity.
The paper highlights the importance of considering the aforementioned challenges within the framework of the adoption of artificial intelligence. A literature review was conducted to find out its potentially most beneficial fields of application: (i) increasing the accuracy and speed of design, (ii) assessing and lowering risk, (iii) improving sustainability, and (iv) streamlining project management and administrative duties.

Keywords:*labour shortages, low productivity, sustainability, artificial intelligence*

REZIME:
Građevinarstvo je jedna od najvećih djelatnosti, obuhvatajući 10-12 % globalne ekonomije koja se danas susreće s okolišnim, regularnim i drugim izazovima. Ovaj članak istražuje glavne izazove s kojima se suočavagrađevinastvo: izražena nestašica radnesnage i niska produktivnost. Iako je umjetna inteligencija značajno utjecala na napredak određenih djelatnosti, građevinarstvo je sporo reagiralo unatoč oštroj nestašici radne snage i sporom rastu produktvnosti.
Članak ističe važnost razmatranja navedenih izazova unutar okvira utemeljenog na umjetnoj inteligenciji. Proveden je pregled literature kako bi se otkrila potencijalno najkorisnija područja njene primjene: (i) povećanje točnosti i brzine projektiranja, (ii) procjena i smanjenje rizika, (iii) poboljšanje održivosti i (iv) pojednostavljenje upravljanja i administriranja projektom.

Ključne riječi*: pomanjkanje radne snage, niska produktivnost, održivost, umjetna inteligencija*

EFFECTS OF BINARY SIMILARITY METRICS IN RECOMMENDER SYSTEMS FOR JESTER JOKES DATASET

Edip Senyurek[1,2], Jasmin Kevric[3]
[1]International Burch University, Sarajevo, Bosnia and Herzegovina
[2]Vistula University, Warsaw, Poland
[3]International Burch University, Sarajevo, Bosnia and Herzegovina

Edip Senyurek

Jasmin Kevric

ABSTRACT:
Recommendation systems have become an indispensable element foronline vendors thatcontiniuosly increasetheire-commerceactivity.On the other hand, customers ask the system to get recommendations for the target product. The quality of the prediction becomes important from accuracy and efficiency point of view. Accuracy and efficiency of prediction may vary depending on different factors. In this study, we implemented k-modes clustering algorithm on a dense dataset called Jester Jokes. We studied effects of eleven binary similarity metrics on the quality of predictionwhile implementing collaborative filtering approach. The metrics used are:Anderberg (A), Dice (D), Gower2 (G), Hamann (H), Jaccard (J), Kulczynski (K), Ochiai (O), Pearson (P), Simple Matching (SM), Sokal and Sneath (SS), and Yule (Y). …
Our study is one of the first studies comparing numerous binary similarity metrics for recommender systems based on both predictive and computation performance.

Keywords: *binary similarity metrics, classification accuracy, f-measure, collaborative filtering, recommender system, jester dataset*

REZIME:
Sistemi preporuke postali su nezaobilazan element za online prodavače koji su kontinuirano povećavajusvoju aktivnost e-trgovine. S druge strane, kupci traže od sistema preporuke za ciljni proizvod. Kvalitet predviđanja postaje važan sa stanovišta tačnosti i efikasnosti. Tačnost i efikasnost predviđanja mogu varirati u zavisnosti od različitih faktora. U ovoj studiji implementirali smo k-modes algoritam za klasterizaciju na gustom skupu podataka pod nazivom Jester Jokes. Proučavali smo efekte jedanaest binarnih metrika sličnosti na kvalitet predviđanja dok smo implementirali kolaborativni pristup filtriranju. Metrikesličnosti koje smo koristili su: Anderberg (A), Dice (D), Gower2 (G), Hamann (H), Jaccard (J), Kulczynski (K), Ochiai (O), Pearson (P), Simple Matching (SM), Sokal i Sneath (SS) i Yule (Y). …
S druge strane, D, G, J, K i O bili su među najgorim. Metrika sličnosti, A, dala je mješovite performanse. Naša studija je jedna od prvih studija koja upoređuje brojne binarne metrike sličnosti za sisteme preporuke na osnovu prediktivnih performansi i računske efikasnosti.

Ključne riječi: *binarne metrike sličnosti, tačnost klasifikacije, f-mjera, kolaborativno filtriranje, sistem preporuke, Jester skup podataka*

Autors Index – Indeks autora

SOCIETY FOR ROBOTICS OF BOSNIA AND HERZEGOVINA

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

Adrress:
Petog Korpusa br. 3,
77 000 Bihać,
Bosnia and Herzegovina
www.robotika.ba
E-meil: robotikabih@yahoo.com

President Society for Robotics B&H
Prof. Safet Isić, PhD.

Secretery general
Society for Robotics B&H
Prof.Isak Karabegović, PhD.

DRUŠTVO ZA ROBOTIKU U BOSNI I HERCEGOVINI

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

Adresa:
Petog Korpusa br. 3,
77 000 Bihać,
Bosna i Hercegovina
www.robotika.ba
E-meil: robotikabih@yahoo.com

Predsjednik Društva za robotiku
Prof.dr.sc.Safet Isić

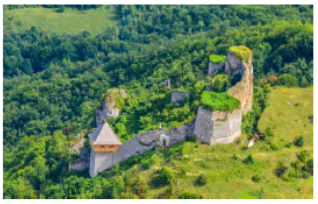
Generalni sekretar
Društva za robotiku
Prof.dr.sc. Isak Karabegović

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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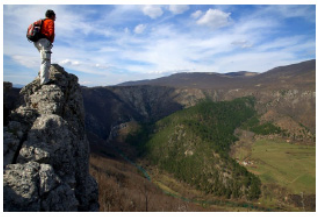

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