2nd International Conference "New Technologies NT-2015"
2. internacionalna konferencija „NOVE TEHNOLOGIJE NT-2015"

SOCIETY FOR ROBOTICS OF B&H
ACADEMY OF SCIENCES AND ARTS OF B&H
FACULTY OF MECHANICAL ENGINEERING IN MOSTAR
TECHNOLOGY PARK INTERA
BOSNIA AND HERZEGOVINA

CONFERENCE PROGRAM
PROGRAM KONFERENCIJE

BOOK OF ABSTRACTS
KNJIGA SAŽETAKA

"NT-2015"

„NEW TECHNOLOGIES NT-2015"
„NOVE TEHNOLOGIJE NT-2015"

Mostar, Bosnia and Herzegovina, 24-25. april 2015.,NT-II,Br-II.

Editors: Isak Karabegović, Vlatko Doleček, Sead Pašić

Pokrovitelji

	MINISTARSTVO CIVILNIH POSLOVA BOSNE I HERCEGOVINE
	VLADA FEDERACIJE BOSNE I HERCEGOVINE
	AKADEMIJA NAUKA I UMJETNOSTI BOSNE I HERCEGOVINE
	FEDERALNO MINISTARSTVO OBRAZOVANJA I NAUKE BOSNE I HERCEGOVINE
	FEDERALNO MINISTARSTVO ENERGIJE,RUDARSTVA I INDUSTRIJE BOSNE I HERCEGOVINE
	VANJSKOTRGOVINSKA KOMORA BOSNE I HERCEGOVINE
	PRIVREDNA-GOSPODARSKA KOMORA FEDERACIJE BOSNE I HERCEGOVINE
	VLADA UNSKO SANSKOG KANTONA
	GRAD BIHAĆ
	NACIONALNI PARK UNA
	BH TELEKOM
	KULA GRADAČAC INDUSTRIJA MODNE KONFEKCIJE
	„RAUSK" RAZVOJNA AGENCIJA USK
	INTERA TEHNOLOŠKI PARK MOSTAR
	JP HRVATSKE TELEKOMUNIKACIJE d.d. MOSTAR

CONFERENCE PROGRAM - PROGRAM KONFERENCIJE
APSTRACTS - SAŽETCI

Organizer / Organizator:
SOCIETY FOR ROBOTICS OF B&H - Društvo za robotiku u Bosni i Hercegovini
Co-organizers / Suorganizatori:
UNIVERSITY OF MOSTAR FACULTY OF MECHANICAL ENGINEERING IN MOSTAR
Univerzitet u Mostaru, Mašinski fakultet Mostar,
TECHNOLOGY PARK INTERA/Intera tehnološki park Mostar

Sponsor / Pokrovitelj
ACADEMY OF SCIENCES AND ARTS OF BOSNIA AND HERZEGOVINA
AKADEMIJA NAUKA I UMJETNOSTI BOSNE I HERCEGOVINE
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NEW TECHNOLOGIES „NT-2015"

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.

Mostar, February 2, 2015. *THE ORGANIZERS*

NOVE TEHNOLOGIJE „NT-2015"

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.

Mostar, 02. 2. 2015. *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).

The main objectives of the conference are:

- *Transfer of new and high technologies that serves to improving research and development work and implementation in production, in order to achieve technological and economic growth of domestic production in domestic companies.*
- *Transfer of practical knowledge and results of their own research,r to strengthen competitiveness of domestic companies*
- *Promotion of technological and economic feasibility of applying new technologies in companies' industrial production*
- *Organizing and conducting training in knowledge update and innovation lifelong learning*
- *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 about justification for introducing new products and production program, introduction of new technologies*

Mostar, February 2, 2015. *EDITORS*

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).

***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 domaće proizvodnje u domaćim kompanijama.*
- *Transfer praktičnih znanja i rezultata vlastitih istraživanja, s ciljem jačanja konkurentske sposobnosti domaćih kompanija.*
- *Promocija tehnološke i ekonomske opravdanosti primjene novih tehnologija u industrijskoj proizvodnji u kompanijama.*
- *Organiziranje i izvođenje edukacije iz programa osvježavanja i inoviranja znanja i cjeloživotnog učenja.*
- *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 uvođenja novih proizvoda i programa proizvodnje, uvođenje novih tehnologija.*

Mostar, travanj/april 2015. *EDITORI*

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CONFERENCE PROGRAM
PROGRAM KONFERENCIJE

Friday/Petak, 24. 4. 2015. god.

Registration - Registracija učesnika
8:00 - 10:00
Hall/Sala Technology Park„INTERA"Mostar

Opening - Svečano otvaranje 2. "NT-2015" konferencije
Welcoming speech/Pozdravna riječ
Opening Conference/Otvaranje konferencije
Hall/Sala Technology Park „INTERA" Mostar
10:00 - 10:30

Plenary Session - Plenarna sjednica
10:30 – 11:30

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FUTURE OF ENERGY–CLEAN ENERGY
ENERGIJA BUDUĆNOSTI–ČISTA ENERGIJA

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THORIUM REACTOR NUCLEAR POWER PLANTS
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004 ***Tešnjak S.***
ENERGY SUPPLY OF EUROPEAN UNION TO YEAR 2060.
OPSKRBA EVROPSKE UNIJE ENERGIJOM DO 2060. GODINE

Coffee break - Kafe pauza
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Friday/Petak, 24. 4. 2015. god.

Session - Sekcija I/1: 15:30 - 18:30

Predsjedavajući: ***Prof.dr. Ivan Polajner, Prof.dr.sc. Salah-Eldien Omer***
Sekretar: ***Mr.sc. Ermin Husak*** *(Coffee break - Kafe pauza 17:00-17:15)*

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I 11 ***Mahmić M., Karabegović E., Arnautović M.***
EXPERIMENTAL INVESTIGATION AND MODELING OF DIE LOAD FOR HYDROFORMING OF CROSS TUBE
EKSPERIMENTALNO ISTRAŽIVANJE I MODELIRANJE OPTEREĆENJA ALATA ZA HIDROBLIKOVANJE RAČVE

Friday/Petak, 25. 4. 2015. god.

Session - Sekcija I/2: 15:30 -18:30

Predsjedavajući: ***Prof.dr.sc. Marina Mijanović-Markuš, V.prof.dr. Safet Isić***

Sekretar: ***Mr.sc. Edin Šunje*** *(Coffee break - Kafe pauza 17:00-17:15)*

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Friday/Petak, 24. 4. 2015. god.

Session - Sekcija II: 15:30 -18:30

Predsjedavajući: ***Prof.dr.sc. Đorđe Jovanović, prof.dr. Tarik Kupusović***
Sekretar: ***Mr.sc. Emir Nezirić*** *(Coffee break - Kafe pauza 17:00-17:15)*

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Saturday/Subota, 25. 4. 2015. god.

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Predsjedavajući: ***V.prof.dr.Safet Isić, Doc.dr. Raif Seferović***
Sekretar: ***Mr. sc. Edin Nezirić*** *(Coffee break - Kafe pauza 10:30-10:45)*

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Saturday/Subota, 25. 4. 2015. god.

Session - Sekcija III: 9:00 - 11:30

Predsjedavajući: ***Prof.dr.sc, Ramo Šendelj, V.prof.dr.sc. Tiro Dragi,***
Sekretar: ***Mr.sc. Edin Šunje*** *(Coffee break - Kafe pauza 10:30-10:45)*

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Session - Sekcija IV: 9.00 - 11.30

Predsjedavajući: ***Prof.dr.sc. Zemira Delalić, Prof.dr.sc. Vildana Alibabić***
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Saturday/Subota, 25. 4. 2015. god u 12:00
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Završna plenarna sjednica 2. NT-2015 konferencije

Saturday/Subota, 25. 4. 2015. god.

Excursions - Izleti: 14:00

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ABSTRACTS
SAŽETCI

„NEW TECHNOLOGIES"
„NOVE TEHNOLOGIJE"

NT-2015

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Mostar,24-25. travan/april 2015.

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FUTURE OF TECHNOLOGY

TEHNOLOŠKA BUDUĆNOST

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ABSTRACT:
This paper descibes eight technologies that will mark the technological future in different segments of life and industries. Every day we are impressed with an increasing number of technological innovations. However, that's nothing compared to what is yet to come It is very difficult to predict all future inovations and in this paper we selected the most important technologies, that by our opinion, will be the predominant factors in the future technology development. Considering that there are fast changes in technology development, it is impossible to exactly predict its future and in this seanse our choice can be considered only as an prediction of the most probable future development.which includes the following technologies: information and communication, energy, bioengineering, bionics, new materials, space and nanotechnology.

Keywords: *technologies, future, development, communication, energy, bionica, new materials, space technologies, nanotechnogies.*

SAŽETAK:
Gotovo svakodnevno impresionira nas sve veći broj tehnoloških inovacija. No, to nije ništa u odnosu na ono (naprema onome) što tek dolazi. Fascinira pogled već i na samo dio budućnosti tehnologije. Donosimo vam dio toga, kao svojevrsni preview budućnosti. U ovom radu dat je izbor od osam tehnologija koje bi, po našem mišljenju, trebalo da obilježe tehnološku budućnost u različitim djelatnostima i raznim industrijama. Kako, generalno gledano, živimo u vrijeme veoma brzih promjena, to je svaku budućnost, a posebno tehnološku, dosta rizično prognozirati. Zato će, vjerovatno, biti mnogo onih koji će postaviti pitanje da li je najbolji izbor baš ovih osam tehnologija, za koje smo ubijeđeni da će u dobrom procentu obilježiti naš skori tehnološki razvoj. To su, po našemn mišljenju, slijedeće tehnologije: informaciono-komunikacione, energetske, bioinženjering, bionika, novi materijali, kosmičke i nano tehnologije.

Ključne riječi*: tehnologija, budućnost, razvoj,komunikacija,energetika,bionika,novi materijali,kosmička tehnologija,nanotehnologija.*

FUTURE OF ENERGY – CLEAN ENERGY

ENERGIJA BUDUĆNOSTI – ČISTA ENERGIJA

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ABSTRACT:*Today worldwide, economic, industrial and social development is connected to the energy. Energetic stability and security is one of the primary questions in the last several years. Countries around the world, including European Union, despite its high level of development and evolution of their relationship to the issue of energy security, are also dealing with decreasing of the energy security roll in reducing human impact on the climate. Energy is of the key importance for any country development whether is about industry or economy of the countries. Without adequate policy in the energy sector is not possible to achieve industrial and economic progress. However, as far as energy is important for development, it is just mechanism in achieving the ultimate goals - a sustainable economy, a clean environment, high standard of living, prosperity and health of the population. Energy is a priority that needs to be dealt with in accordance of the world policy and European Union by 2030 that is use of renewable energije. In this paper development and application of renewable energy sources in the world, European Union and Bosnia and Herzegovina, as well as investment in renewable energy with prospects in the coming period is given. Finally, a conclusion that clean energy is the energy of the future, which ultimately has to be 100% applied is given and this is only possible through the development of new technologies.*

Keywords: *renewable energy sources, hydro energy, wind energy, solar energy, biomass energy, geothermal energy*

SAŽETAK: *Danas u cijelom svijetu ekonomski, industrijski i društveni razvoj vezan je za energiju.Energetska stabilnost i sigurnost postalo je jedno od najvažnijih pitanja u posljednjih nekoliko godina.Zemlje cijelog svijeta, pa tako i Evropske Unije, i pored svoje visoke razvijenosti i evolucije svog odnosa prema pitanju energetske sigurnosti, također se suočavaju s problemom opadanja njene uloge u smanjenju ljudskog utjecaja na klimu. Energija je od ključne važnosti za razvoj bilo koje zemlje,kada je u pitanju njena industrija i ekonomija u pitanju. Bez adekvatne politike u poslovanju energetskog sektora nije moguće ostvariti industrijski i ekonomski napredak. Ipak, koliko god energija bila važna za razvoj, ona predstavlja samo mehanizam u ostvarivanju krajnjih ciljeva – održive ekonomije, čiste okoline, visokog životnog standarda, prosperiteta i zdravlja stanovništva. Energija je prioritet kojeg treba rješavati u skladu sa politikom svijeta i Evropske Unije do 2030. godine kroz korištenje obnovljivih izvora energije. U ovom radu je obrađen razvoj i primjena obnovljivi izvora energije u svijetu, Evropskoj Uniji i Bosni i Hercegovini, kao i investiranje u obnovljive izvore energije sa perspektivama u narednom periodu.Na kraju je dat zaključak da je čista energija, energija budućnosti, koja u konačnici mora da bude 100% primijenjena, a to je moguće samo kroz razvoj novih tehnologija koje će to obezbijediti.*

Ključne riječi*: obnovljivi izvori energije, hidroenergija, energija vjetra, solarna energija, energija biomase, geotermalna energija*

THORIUM REACTOR NUCLEAR POWER PLANTS

NUKLEARNE ELEKTRANE S TORIJSKIM REAKTOROM

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ABSTRACT:
Thorium molten salt reactors (MSR) provide for potentially safer, more useful and more stable form of nuclear energy. They produce practically no nuclear waste.

Keywords: *Thorium reactor, Molten salt reactor (MSR), Thorium molten salt reactor (MSBR), Thorium liquid gas reactor (LFTR)*

SAŽETAK:
Torijem rastaljeni punjeni reaktori (MSR) omogućuju potencijalno sigurniji, korisniji i stabilniji oblik nuklearne energije. Praktički nemaju otpada.

Ključne riječi: *Teorijski reaktor, Reaktor s rastaljenom solju (MSR), Torijski rasplodni reaktor s rastaljenom solju (MSBR), Torijski reaktor s tekućim plinom (LFTR).*

THE INFLUENCE OF DIFFERENTE TYPES Zn COATING ON PROPERTIES OF RESISTANCE SPOT WELDS

UTJECAJ VRSTE Zn PREVLAKE NA KARAKTERISTIKE ELRKTROODPORNIH TAČKASTIH VAROVA

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ABSTRACT:
The process used and the composition of the molten metal in the case of the hot dipping process determine the physical and chemical properties of the coating. From the point of view of resistance spot welding the main emphasis of the coating is the modification of the contact resistance between the faying surfaces It should be emphasized that not only the starting value of the contact resistance matters, but also its variation with temperature. As resistance spot welding of coated steels is used very often, it is very important to know the implications different types of coating make on the resistance spot welding process.

Keywords*: mild coated steel, welding parameters, contact resistance, welding parameters, tensile - shear test, metallographic evaluating of welds.*

SAŽETAK:
U radu su prikazani utjecaji ključnih parametra zavarivanja na osnovne karakteristike elektroodpornih tačkastih varova, kod protivkorozijsko zaštičenog čeličnog lima, sa Zn prevlakom. Ustanovljeno je, da kod istog čeličnog lima, prevučenim sa nazivno jednako debelom zaštitom Zn, nanešenog sa potapanjem u vrući Zn ili elektrolitskii, može se postići približno ista korozijsku postojnost, ali ne i jednaki kvalitet tačkastih varova. Naime, kod elektroodpornog zavarivanja, vrsta i stanje površine primjetno utječu već na sam početak formiranje elektroodpornog tačkastog vara, a pogotovo na njegove metalografske i mehanske karakteristike.

Ključne riječi*:konstrukcijski čelik, kontaktna električna odpornost, parametri zavarivanja, vučno – smicajna čvrstoča, metalografska procjena varova*

ADVANCED CUTTING PROCESSES OF METALLIC MATERIALS

NAPREDNI PROCESI OBRADE REZANJEM METALNIH MATERIJALA

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ABSTRACT:
Paper reviews some of the main developments in cutting technology, and presents some results of research performed in Metal Cutting and Machine Tools laboratory at University of Zenica. In the first part of paper the main aspects of advanced cutting processes like high-speed machining, hard machining, dry machining, minimum quantity lubrication (MQL) machining, and advanced MQL machining are described. In the second part of paper the results of experimental investigation are presented. There are several experimental setup concerning high-speed turn-milling of carbon steel, ductile steel, and brass, hard turning of hardened steel, and MQL machining of aluminium bronze. Results of investigation show so many advantages of mentioned cutting processes over the conventional ones.

Keywords: *High speed machining, Dry machining, MQL machining, Hard machining, Metallic materials*

SAŽETAK:
U radu su prikazani glavni ravojni pravci u obradi metala rezanjem i prezentirani neki rezultati istraživanja u oblasti naprednih tehnologija provedeni u Laboratoriji za obradu rezanjem i alatne mašine Univerziteta u Zenici. U prvom dijelu rada objašnjeni su glavni aspekti naprednih proizvodnih tehnologija rezanjem kao što su visokobrzinska obrada, tvrda obrada, suha obrada, polusuha obrada, te napredna polusuha obrada. U drugom dijelu rada prikazani su rezultati eksperimentalnog istraživanja. Eksperimentalna istraživanja se odnose na visokobrzinsko struganje-glodanje ugljeničnog čelika, duktilnog čelika i mesinga, zatim tvrdu obradu otvrdnutog čelika i polusuhu obradu aluminijumske bronze. Dobiveni rezultati pokazuju mnoge prednosti naprednih postupaka obrade u odnosu na konvencionalne.

Ključne riječi: *Visokobrzinska obrada, suha obrada, polusuha obrada, tvrda obrada, metalni materijali*

OPTIMAL LOCATION OF INFRASTRUCTURAL FACILITIES

OPTIMALNA LOKACIJA INFRASTRUKTURNIH OBJEKATA

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ABSTRACT:
New technologies have made it possible for many undesirable facilities, such as e.g. waste disposals, trans-shipment centres, waste transportation vehicles, etc. to become either very little or almost not at all harmful to the human health. And yet, the majority of citizens want these and similar facilities to be as far from them as possible. This may usually be for psychological reasons. Therefore, the decision-makers have a difficult and complex task of convincing the residents of the settlement to accept such infrastructural facilities like the desirable ones, because then the transportation costs are minimal. On the other hand, every settlement wants to have the desirable facilities, such as: clinics, schools, post-offices, offices, bus stops and the like, as near as possible. The methods of operational studies make it possible to find optimal locations for undesirable and desirable facilities in a certain area, and to analyse the results.

The paper deals with the concrete examples of locations of the waste disposal on the territory of Una-Sana Canton.

Keywords: *transportation network, location problems, location of desirable and undesirable facilities*

SAŽETAK:
Nove tehnologije učinile su da mnogi nepoželjni objekti, kao npr. deponiji otpada, pretovarni centri, vozila za prijevoz otpada vrlo malo ili skoro nikako nisu opasni za ljudsko zdravlje. Ipak svako naselje želi da su takvi ili slični objekti što dalje od njih. S druge strane poželjni objekti, kao što su: klinike, škole, pošte, uredi, stajališta autobusa i slično, svako naselje želi da mu je što bliže. Metode operacijskih istraživanja omogućuju da se nađu optimalne lokacije za nepoželjne i poželjne objekte na nekom prostoru.

U radu je obrađen konkretni primjeri lokacije deponije otpada na prostoru USK.

Ključne riječi: *transportna mreža, lokacijski problemi, lokacija poželjnih i nepoželjnih objekata*

EFFICIENT EFFECTS OF ROBOTS AND CNC CENTERS IN THE WOOD INDUSTRY

EFEKTIVNA USPJEŠNOST ROBOTA I CNC CENTARA U DEVNOJ INDUSTRIJIU

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ABSTRACT:
In the article we shortly described the usage of CNC machines and robots in the wood processing industry. We mentioned some of the reasons that lead to the late usage of robots in this field of industry. In a graphic we represent the general expansion of robot usage in the world as there lustration of their presence everywhere. Shortly we represent several examples of robot usage in the wood processing industry and explaining the reasons for that. At the end of the article we represent special cases in wood processing industry for the usage of robots. Also we mentioned certain centres where the robots are in use, and the reasons why the robots are used, from efficiency to the protection of workers or quality needs.

Keywords: *CNC machines, reasons for usage, robots in certain processing phases in wood processing industry*.

SAŽETAK:
U članku su opisane osnovne potrebe za CNC machinama i robota u drvnoj industriji. Navedeni su i razlozi zbog čega je drvna industria kasnila sa upotrebom robota u samoj procesnoj industriji. Grafički je prikazana općenita ekspanzija upotrebe robota u svijetu. Nakon toga su navedeni neki primjeri upotrebe robota u drvnoj industria sa kratkim komentarima vezano za mjesto upotrebe. Na kraju članka su prezentirani specijalni slučajevi gdje u drvnoj industriji koriste robote te centri koji su opremljeni sa robotima zbog niza razloga od efikasnosti u proizvodnji do zaštite radnika ili njegove zamjene zbog opasnosti na radnom mjestu.

Ključne riječi: *CNC mašine, razlozi za upotrebu, roboti u određenim fazama proizvodnje u drvnoj industriji*

RESEARCH OF OXIDATION PROPERTIES OF STEEL 17-7PH

ISTRAŽIVANJE OKSIDACIONIH SVOJSTAVA ČELIKA 17-7PH

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ABSTRACT:

This paper presents the results of heat resistance precipitacion hardened steel 17-7PH with modified chemical composition. Operating temperature for steel 17-7PH is up to 480°C. Standard ASTM G54-84 (Reapproved 1996) includes the determination of preliminary information about the relative growth of the oxide layer and the microstructural properties of oxide on the surface to temperatures greater than 540°C. In order to obtain information about the behavior of materials with modified chemical composition, determining the relative resistance to oxidation at constant temperature heat resistance test was conducted on samples batch V1772 and V1774, the temperature of 600° C in cycles 24, 48 and 72h.

Keywords: *Steel 17-7PH, oxidation, heat resistance*

SAŽETAK:

U ovom radu su predstavljeni rezultati istraživanja vatrootpornosti precipitaciono ojačanog čelika 17-7PH sa modifikovanim hemijskim sastavom. Radna temperatura čelika 17-7PH je do 480°C. Standard ASTM G54-84 (Reapproved:1996) obuhvata određivanje preliminarnih informacija o relativnom rastu oksidnog sloja i mikrostrukturnim svojstvima oksida na površini za temperature veće od 540°C. U cilju dobijanja informacija o ponašanju materijala sa modifikovanim hemijskim sastavom, određivanje relativne otpornosti materijala na oksidaciju pri konstantnoj temperaturi provedeno je ispitivanje vatrootpornosti na uzorcima talina V1772 i V1774, za temperaturu 600°C u ciklusima 24h, 48h i 72h.

Ključne riječi: *Čelik 17-7PH,* oksidacija, vatrootpornost

STEEL MACHINABILITY MODELLING WITH GENETIC PROGRAMMING

MODELIRANJE OBRADIVOSTI ČELIKA GENETSKIM PROGRAMIRANJEM

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ABSTRACT:
The study presents the attempt for modelling steel machinability, which was determined according to international standard ISO 3685: Tool-life Testing with Single-point Turning Tools. The experimental data on chemical composition, hardness, deformation rate and tool life time of 292 batches and 20 different grades were collected. Afterward the modelling with genetic programming method was performed. The results show that the solution can be easily used in practice and consequently the steel machinability can be improved.

Keywords: *steel machinability, turning, modelling, genetic programming*

CONCLUSION

In comparison to ordinary steels, the extra machinability steels represent a branch which is gaining high level of interest, as in the research field as well as on the market. Therefore, it is very important to bring their advantageous capability of machining at higher speeds to the highest level with additional optimization methods.The testing for evaluation of steel machinability is carried out according to international standard ISO 3685. The test is performed on a CNC lathe by single-point turning process. The aim of the test is to develop a cutting time-cutting speed dependence of a certain steel batch. In the research the experimental data of 292 batches were collected. The most important parameters that influence on the extra machinability are deformation rate, surface hardness and chemical composition.The prediction of extra machinability of steel with genetic programming was made. 100 independent civilizations of mathematical models were developed. The best model deviated for 3.7 % from the average experimental value.Also the evaluation of parameters' influence was made. The biggest influence on the extra machinability value has the content of carbon, second is the content of vanadium. The evaluation also shows that the content of oxygen and the deformation rate have no influence at all and they could be excluded from the model.Research has shown that genetic programming method for prediction of steel machinability is one of the means towards better production planning, to reduce the costs of material testing and time losses. The additional research could also include the optimization of the chemical composition in order to achieve higher machinability values. The research can be used in practise.

MICROFORMING IN METAL FORMING

MIKROFORMING

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ABSTRACT:
The work carried out some analysis mikroforming. Mikroforming in metal forming the production of small dimensions in at least two axes not exceeding 2mm. Technology is mikroforming differs in many ways from the conventional technology of metal forming.
It is well recognized that expertise, experience, and theoretical knowledge available in conventionally sized metal forming cannot be simply transferred to microforming. This is due to so-called size effects which have distinct effect on material flow, friction and other process characteristics. Today, process simulation is a standard tool in industry, applied to support process lay-out and its optimization. However, as it is based on continuum mechanics, it is size-invariant at least for cold forging. Hence, it is obvious that due to the size effects, conventional simulation cannot be applied to microforming. In this paper two approaches are presented how to model specific phenomena of microforming in particular concerning material flow and friction. These are the mesoscopic model and a combination of the general friction law and mechanical rheological model, respectively. Both models are brought together to be finally applied to a combined micro cold-extrusion process. Microforming coarse grains, macroforming fine grains.

Keywords: *metal forming, microforming*

CONCLUSION

The work carried out some analysis mikroforming. Mikroforming in metal forming the production of small dimensions in at least two axes not exceeding 2mm. Technology is mikroforming differs in many ways from the conventional technology of metal forming.
Simulation of microforming processes close to the results of experiments is winning a growing interest in microforming society. It is well recognized, that simulation represents an important presupposition for pushing forward the application of microforming technology in practice. As it has been shown for some selected cold forging processes, a first step has been done successfully to reach this goal. The instruments developed so far are capable to model essential phenomena of microforming at least on a qualitative level. Additionally, on the basis of experimental and simulative results, the most relevant gaps in modeling are identified as well as the methods to fill them. Hence, progress can be expected in near future towards generalization of the modelling approach and its applicability on other processes relevant for microforming.

MANUFACTURING OF VITAL PARTS BY ROTARY FORGING

PROIZVODNJA ZNAČAJNIH KOMADA ROTACIONIM KOVANJEM

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ABSTRACT:
Cross – joint component is a vital element which is integrated in many mechanical engineering transmission systems. It transmits rotational movement in the transmission chain and it is loaded by high bending and shear stresses. There exist high requirements in terms of mechanical properties of cross-joint, which is understandable having in mind its important and responsible role in many mechanical engineering assemblies. Current paper presents one incremental method - orbital (or rotary) forging - which is relatively new technology for production of cross – joint. Orbital forging is an incremental bulk metal forming operation in which billet is placed at lower die whereas upper die, which performs rotational movement, is inclined for a small angle in respect to lower die . In most usual case, upper die also executes axial movement toward lower die, pressing the billet, but in some process modifications vice versa option has been also employed. Advantages and drawbacks, as well as main process parameters of orbital forging are presented and discussed. In concrete case, mechanical properties of one cross-joint part made by orbital forging process has been determined and compared with the component manufactured by classical forging. Relevant conclusions have been made.

Keywords: *Cross joint component, orbital forging, comparison*

CONCLUSION

In order to ensure constant growth potential and high position at the market, production industry must continuously pursuit and improve its manufacturing excellence. This can be done by intensive research work which results should be new, innovative processes with improved technical and economical performances. Current work elaborates application of one advanced incremental technology in manufacturing of cross – joint component.

Main characteristics of rotary forging are presented as well as the predominant fields of its industrial implementation. Short description of the performed rotary forging is given with the emphasis on the mechanical property at the critical location of the cross – joint. Via hardness measurement strength at the cross section of the sleeve is determined. Obtained values are compared with the corresponding values at the component fabricated by classical hot forging. It has been found that component produced by rotary forging possess higher strength values over the cross section of the sleeve than classically hot forged component. This difference is approx. 25%.

THE LIMIT VALUES OF MAXIMAL DEGREE OF DEFORMATION FOR COLD FORMING

GRANIČNE VRIJEDNOSTI MAKSIMALNOG STEPENA DEFORMACIJE PRI DEFORMISANJU U HLADNOM STANJU

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ABSTRACT:
Obtained diagram of limit deformability for two, three, four and five stage dies and functional relation between number of rings in die and maximal possible total degree of deformation that is resulting from diagram, make possible new approach in designing of multi – stage dies for wall thickness reduction.

Keywords: *maximal logarithmic deformation, deep drawing with wall thickness reduction.*

SAŽETAK:
Dobiveni dijagram granične deformabilnosti za dvostepene, trostepene, četverostepene i petostepene alate i funkcionalna veza između broja prstenova u alatu i maksimalno mogućeg ukupnog stepena deformacije, koja iz njega proizilazi, omogućavaju novi pristup u projektovanju višestepenih alata sa redukcijom debljine zida.

Ključne riječi: *maksimalna logaritamska deformacija, duboko izvlačenje sa redukcijom debljine zida*

RESEARCH IMPACT OF METALLIC COATING NICRALY ON HEAT RESISTANCE IRON BASED SUPERALLOY

ISTRAŽIVANJE UTICAJA METALNE PREVLAKE NiCrAlY NA VATROOTPORNOST JEDNE SUPERLEGURE NA BAZI ŽELJEZA

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ABSTRACT: *For metal alloys which in service conditions of elevated temperatures, an important place occupied by reactions which are conducted between the alloy and the environment. If the processes are performed at high temperatures in the presence of oxygen, may change the phase composition surface alloys. In order to understand the kinetics of oxidation in applied metallic coatings NiCrAlY on iron based superalloy A286 mentioned basic thermodynamic aspects when turning these processes. Fire resistance tests was performed by determination of the reaction rate on the basis of measuring the loss of mass in the process of cyclic heating and cooling, with a temperature of 1000 ° C, and after keeping the samples at different time intervals. It has been found that coatings significantly increase resistance against oxidation. This is particularly important, given that the test is conducted at an extremely high temperature in the furnace with air atmosphere with long-term retention at that temperature. It was also observed that the initial slightly higher rate of oxidation, in a later period of time is reduced, on the basis of which it can be concluded that there was a complete stabilization of the structure of the coating. The effect of coating thickness has a positive impact on the fire resistance, because increasing coating thickness decreases the rate of oxidation.*

Keywords: *Metal coating NiCrAlY, oxidation, coating thickness*

SAŽETAK: *Kod metalnih legura koje u uslovima eksploatacije rade na povišenim temperaturama, važno mjesto zauzimaju reakcije koje se odvijaju između legure i okoline. Ako se procesi odvijaju na visokim temperaturama u prisustvu kisika, može doći do promjene faznog sastava površine legura. U cilju razumijevanja kinetike oksidacije kod nanesene metalne prevlake NiCrAlY na superleguru na bazi željeza A286, navedeni su osnovni termodinamički aspekti prilikom odvijanja ovih procesa. Ispitivanje vatrootpornosti izvršeno je određivanjem brzine oksidacije na osnovu mjerenja gubitka mase u procesu cikličnog zagrijavanja i hlađenja, sa temperature 1000ºC, a nakon zadržavanja uzoraka u različitim vremenskim intervalima. Utvrđeno je da nanesene prevlake znatno povećavaju otpornost protiv oksidacije. To je posebno značajno, obzirom da je ispitivanje provedeno na izuzetno visokoj temperaturi, u peći sa zračnom atmosferom sa dugotrajnim zadržavanjem na toj temperaturi. Takođe je zapaženo, da početna nešto veća brzina oksidacije, u kasnijem vremenskom periodu se smanjuje, na osnovu čega se može zaključiti da je došlo do potpune stabilizacije strukture prevlake. Uticaj debljine prevlake ima pozitivan uticaj na vatrootpornost, jer povećanje debljine prevlake smanjuje brzinu oksidacije.*

Ključne riječi: *Metalna prevlaka NiCrAlY, oksidacija, debljina prevlake*

EXPERIMENTAL INVESTIGATIONS AND MODELING OF DIE LOAD FOR CROSS TUBE HYDROFORMING

EKSPERIMENTALNO ISTRAŽIVANJE I MODELIRANJE OPTEREĆENJA ALATA ZA HIDROOBLIKOVANJE RAČVE

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ABSTRACT:
Permanent research, analysis and applications of experimental results in the plastic forming processes have as an objective improving and modernization of existing production and also application of new technologies. Justification of new technologies applications can be seen in quality and product costs as also productivity and flexibility of production. When die costs are analyzed in plastic forming processes from grate importance are is minimization of die load. Experimental investigations and modeling of input parameters significant for achieving minimal loads was performed and are given in this paper.

Keywords: *hydroforming, plastic forming, die, experiment, modeling*

SAŽETAK:
Permanentna istraživanja, analize i primjena eksperimentalnih rezultata u području plastičnog oblikovanja imaju za cilj unapređenje i modernizaciju postojeće proizvodnje, kao i primjenu novih tehnologija. Opravdanost primjene novih tehnologija uočava se kroz kvalitet i cijenu proizvoda, kao i produktivnost i fleksibilnost proizvodnje. Kada su u pitanju troškovi alata kod procesa plastičnog oblikovanja od velikog je značaja minimizacija opterećenja alata. U vezi s tim izvršena je eksperimentalna provjera i modeliranje ulaznih parametara značajnih za postizanje minimalnog opterećenja, što je i navedeno u ovom radu.

Ključne riječi: *hidrooblikovanje, plastično oblikovanje, alat, eksperiment, modeliranje*

DETERMINATION OF THE CRITICAL ZONES OF THE SHUTTER LATCH AND SPINDLE BY NUMERICAL METHODS

ODREĐIVANJE KRITIČNIH ZONA ZATVARAČA I VRETENA ZASUNA NUMERIČKIM METODAMA

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ABSTRACT:
Numerical methods play an increasingly important role in the process of development new products or improvement of the existing valves.One of the main adventages CAD and CCM (Computational Continuum Mechanics) methods is the possibility of stress-strain analysis of all parts of the valve.
In the paper, the stress-strain analysis of shutter latch and spindle , as its basic components was performed, using two modules of the software package SolidWorks.The first module (SW Flow Simulation) is used to determine the loads due to interaction of fluid and analysed parts of the valve. The second module (SW Simulation) enable to determine the zones of the greatest stress and strain on the body and the shut-off valve and spindle on the basis of previously calculated loads.

Keywords:*shutter latch, FEM, FVM, SolidWorks*

SAŽETAK:
Numeričke metode imaju sve važniju ulogu u procesu razvoja novih i/ili poboljšanju dizajna postojećih zasuna. Jedna od osnovnih prednosti CAD i CCM (Computational Continuum Mechanics) metoda jeste mogućnost naponsko-deformacione analize svih dijelova zasuna.
U ovom radu je izvršena naponsko-deformaciona analiza zapornog tijela i vretena zasuna, kao njegovih osnovnih dijelova, upotrebom dva modula softverskog paketa SolidWorks. Prvi modul (SW Flow Simulation) je iskorišten za određivanje opterećenja koja nastaju uslijed interakcije fluida i analiziranih dijelova zasuna. Drugi modul (SW Simulation) je omogućio da se na osnovu tih opterećenja odrede zone najvećih napona i deformacija na zapornom tijelu i vretenu zasuna.

Ključne riječi: *zasun, MKE, MKV, SolidWorks*

A TOOL DESIGN FOR STATOR OF KAPLAN TURBINE ASSEMBLING

RAZVOJ ALATA ZA MONTAŽU STATORA KAPLANOVIH TURBINA

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ABSTRACT:
The possibility of manipulation of the rotor and stator turbine with vertical shaft is one of the key factors in turbine dismantling. About the speed of implementation and success of the implementation of this stage depends on the whole process of dismantling and later assembling. In a case of manipulation stator unit for Kaplan turbines, due to their large dimensions, weight and often of limited space, his lifting or dismantling is a complex procedure that requires adequate tool. A tool must be adapted to the dimensions and weight of the stator as well with installed bridge cranes in a engine room.
This paper presents a development of a tool for the manipulation stator Kaplan turbines and strain gages measuring for the purposes of the control of the dismantling process.

Keywords: *Kaplan turbine, stator, dismantling, tool, testing*

SAŽETAK:
Mogućnost manipulacije rotorom i statorom turbina sa vertikalnim vratilom jedan je od ključnih faktora u fazi remonta turbina. O brzine realizacije i uspješnosti realizacije ove etape zavisi cijeli postupak demontaže i ponovne montaže. U slučaju manipulacije statorom agregata kod Kaplanovih turbina, zbog njihovih velikih gabarita, mase i često ograničenog prostora, njegova montaža ili demontaža predstavlja složen postupak, za koji je potreban odgovarajući pripravak. Pripravak mora biti prilagođen kako dimenzijama i masi statora tako sa instalisanim mosnim dizalicama u strojari.
U ovom radu je prikazano konstrukciono rješenje pripravka za manipulaciju statorom Kaplanovih turbina i tenzometrijska mjerenja u svrhu ispitivanja pripravka i kontrole procesa demontaže.

Ključne riječi: *Kaplan turbina, stator, demontaža, pripravak, ispitivanje*

FINDING A SOLUTION MORE ADVANCED PROTECTION SYSTEM DUE TO OVERLOAD THE WORKING BODY OF BUCKET WHEEL EXCAVATOR

IZNALAŽENJE NAPREDNIJEG RJEŠENJA SISTEMA ZAŠTITE OD PREOPTEREĆENJA RADNOG ORGANA ROTORNOG BAGERA

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ABSTRACT:
This paper presents an original solution of the system of protection of working wheel overload caused by digging resistance, which covers all relevant structural parameters, and the parameters of extreme regime of the machine under blockade of transmission members. Comparing the relevant parameters in the implementation of old and new solutions, it was more advanced structural design protection system. Its validation was performed measurements in real operating conditions. In addition, the presented model excavator SRs-220 9.5 / 0.5 and redesigned subsystems loading system bucket wheel excavator. The measurement results and perennial exploitation unequivocally confirmed the success of the applied concept of redesign.

Keywords: *bucket wheel excavator, loading system, working wheel, reconstruction, lamellar sliding hinge*

SAŽETAK:
U radu je predstavljeno originalno rješenje sistema zaštite radnog točka rotornog bagera od preopterećenja izazvanog otporom kopanja, koji obuhvata sve relevantne konstrukcione parametre, kao i parametre ekstremnog režima rada mašine u uslovima blokade prenosnih članova. Komparacijom značajnih parametara pri implementaciji starog i novog rješenja, došlo se do naprednijeg konstruktivnog rješenja sistema zaštite. Njegova validacija izvršena je mjerenjima u realnim eksploatacionim uslovima. Osim toga, predstavljen je model bagera SRs-220 9,5/0,5 i redizajnirani podsistemi utovarnog sistema rotornog bagera. Rezultati mjerenja i višegodišnja eksploatacija nedvosmisleno su potvrdili uspješnost primjenjenog koncepta redizajna.

Ključne riječi: *rotorni bager, utovarni sistem, radni točak, rekonstrukcija, lamelna klizna spojnica*

INTELLIGENT TRANSPORTATION SYSTEMS IN OPTIMIZATION OF ORGANIZATION OF VEHICLE TRANSPORTATION

INTELIGENTNI TRANSPORTNI SISTEMI U OPTIMIZACIJI ORGANIZACIJE DRUMSKOG SAOBRAĆAJA

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ABSTRACT:
Before discovery of computers and modern technology, data from different vehicles and their use conditions were collected and calculated by hand. The process was time consuming and prone to errors. Due to that, good planning and organizing of transport was great hazard. By use of computers and computer programs, all relevant data in transport organization are processed in timely manner and without errors, allowing management to bring adequate decisions. Optimization of organization of vehicle transportation of small-number shipments is possible only by use of computers.
Intelligent transportation systems represent the biggest achievement in transportation technology and organization today. These systems allow optimization of transportation using current conditions of several aspects of transportation: consumption of fuel, distance, time and cost.
In this work are analyzed possible uses of intelligent transportation systems and are presented their practical models in road transport.

Keywords: *road transport, intelligent transportation system, optimization*

SAŽETAK:
Prije pojave računara i savremenih tehnoloških rješenja, podaci vezani za rad vozila sakupljani su i obrađivani ručno, što je zahtijevalo više vremena, postojala mogućnost pojava greški, a kao posljedica je smanjena moć planiranja i kvalitetne organizacije transporta. Primjenom računara i računarskih programa, svi releventni podaci se brže i preciznije obrađuju i na osnovu njih se donose upravljačke odluke. Optimizacija organizacije drumskog transporta malokoličinskih pošiljki moguća je samo putem računara. Inteligentni transportni sistemi predstavljaju trenutno najveće dostignuće u primjeni transportne tehnologije i organizacije. Ovi sistemi imaju sposobnost određivanja optimalnog transportnog puta na osnovu trenutnih uslova u saobraćaju sa aspekta potrošnje goriva, vremena putovanja i troškova transporta. U ovom radu su analizirane mogućnosti primjene intelegentnih transportnih sistema i prikazani praktični primjeri primjene u drumskom saobraćaju.

Ključne riječi: *drumski saobraćaj, ITS-inteligentni transportni sistem, optimizacija*

MOBILE ROBOTS DESIGNED BY STUDENTS AND COMPETITIONS IN ROBOTICS

STUDENTSKA IZRADA MOBILNIH ROBOTA I TAKMIČENJA U ROBOTICI

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ABSTRACT:
Mobile robots and autonomous systems are more and more used in scientifical and educational purposes because of great interest of students for that part of mechatronics. By designing mobile robots, students are able to gain knowledge from different areas needed for their future engineering tasks. Robotics includes many areas of mechatronics, such as sensors, actuators, constructing, electronics, programming, etc. Thus, building mobile robot gives students an opportunity to fulfill their teoretical knowledge by solving different practical problems. There is a great number of producers for robot kits, through which students learn in attractive ways, such as Lego Mindstorms, Tetrix, Arduino, Vex etc. Also, students are able to show off their projects at competitions held in Europe and wordlwide. This paper presents a robot made by team of students from study program Mechatronics at Faculty of Mechanical Engineering at University of Montenegro which will demonstrate it's power in category PuckCollect at Robot Challenge Competition 2015.

Keywords: *mechatronics, robotics, mobile robots, studying, students.*

SAŽETAK:
Mobilni roboti i autonomni sistemi se sve više upotrijebljavaju u naučno-obrazovne svrhe zbog velikog interesovanja studenata za ovu oblast mehatronike. Dizajnirajući i praveći mobilne robote, studenti savladavaju više oblasti koje će im biti neophodne u budućem inženjerskom radu. Robotika obuhvata mnoge oblasti mehatronike, kao što su senzori, aktuatori, konstruisanje, elektronika, programiranje itd. Prema tome, izgradnja mobilnih robota omogućava studentima da teorijsko znanje upotpune rješavajući različite praktične probleme. Postoji veliki broj proizvođača opreme, pomoću koje je studentima omogućen atraktivan način učenja, kao što su Lego Mindstorms, Tetrix, Arduino, Vex i sl. Takođe, studenti mogu pokazati svoje projekte na nekim od takmičenja širom Evrope i svijeta. U ovom radu je predstavljen mobilni robot koji je napravio tim studenata sa studijskog programa Mehatronika na Mašinskom fakultetu Univerziteta Crne Gore koji će prikazati njegovu moć u kategoriji PuckCollect na takmičenju Robot Challenge 2015.

Ključne riječi: *mehatronika, robotika, mobilni roboti, učenje, studenti.*

MODELLING OF DIMENSIONAL CHANGES OF POWDER METALLURGY PARTS AFTER PRESSING

MODELIRANJE DIMENZIONALNIH PROMJENA KOMADA PRAŠKASTE METALURGIJE POSLIJE PRESANJA

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ABSTRACT:
Modelling of the dimensional changes of a compact after pressing within of the process of the production of PM parts with cold compaction in the closed die is given. The model is developed on the base of significant process factors applying multilayer neural network architecture with backpropagation learning algorithm. The experimental data for learning and testing of the model are used from the manufacturing process. Results of the simulation in the form of the diagrams and tables are presented. Obtained model gives better results than the one of statistical procedure, i.e. less total mean approximation errors for 3.3%. Practical effects of the modelling is in determination of compaction tool dimensions in accordance with spring-back of the compact after ejection.

Key words: *Modelling, Powder metallurgy, Spring-back, Neural network, Backpropagation algorithm*

CONCLUSIONS

A modelling procedure of spring-back of the green compact after ejection, with modelling results are presented. For modelling multilayer neural network with backpropagation learning algorithm is used. The learning and testing procedures are realized on the base of the experimental data, taken from the manufacture process. The simulation results showed that the obtained model provided less approximation error then one obtained by statistical procedure, mostly used in practice. The advantages of modelling methods using NNs in comparison with statistical procedure and other applicable methods (regressive analysis, cubic spline) are in including the greater number of factors and their interactivity, simultaneous obtaining of greater number of outputs, more common functional forms and iterative approach to solution.A practical application of presented procedure is in determination of the dimensions of compaction tool for the required dimensions of the compact for a given material and corresponding regimes of the process. It is possible to use the same procedure for modelling a spring-back during sizing and coining and other characteristics of PM parts.

WORKSPACE TOPOLOGY OF AN INDUSTRIAL MANIPULATOR

TOPOLOGIJA RADNOG PROSTORA INDUSTRIJSKOG MANIPULATORA

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ABSTRACT:
The purpose of this study is to apply the latest theoretical methods on real industrial manipulators in order to investigate correlations that are hard to interpret with traditional methods. Latest theories on workspace topology propose algebraic description of manipulator workspace which enables engineers to limit the number of inverse kinematics problem solutions during manipulator motion design. By using level-set curve method to describe manipulator workspace, one can easily determine critical points and poses of manipulators. For better understanding, the singularity problem in kinematics and inverse kinematics of industrial manipulators will be explained and a workspace classification for industrial manipulators will be given. A more detailed explanation of the mathematical theories and a description and classification on an example of industrial manipulator will follow. Based on the classification of the real industrial manipulator, the mathematical model for motion analysis was developed for our problem. As a result two alternative graphical presentations of the real industrial manipulator workspace and the critical singularity curves are given.

Keywords: *industrial manipulators, workspace topology, inverse kinematics, motion analysis*

DISCUSION AND CONCLUSION

Singularities significantly restrict a robots mobility and represent a big problem for engineers programing the robots motion. Therefore we should try to reduce singularity areas already in the concept phase of the robot design. If this is not possible, we can at last find singularities prior robot programming and avoid the interference with them. With the approach presented in this paper we can easily graphically predict the singularity areas of industrial robots. The graphical presentation still requires isolating the set of actual angle values of singularity points, and even after the process a perfect accuracy of the results cannot be expected. An analytical solution would resolve this problem and would make it possible to determine the accurate sets of angles for all singularity points in the robots workspace. This is the topic of our current research and will be presented in another article.

USE OF HEURISTIC METHODS IN ELASTIC STRUCTURES OPTIMIZATION

KORIŠTENJE HEURISTIČKIH METODA U OPTIMIZACIJI ELASTIČNIH STRUKTURA

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ABSTRACT:
Optimization of elastic structures is research domain in which research has been intensified in last several decades. Basic and most intensive research in beginning was based at numerical methods. In the last two decades bioinspired methods have been developed for optimization of systems. These methods find a special place in optimization of elastic structures. In this paper three bioinspired methods are presented for optimization of elastic structures: genetic algorithm GA, particle swarm optimization PSO and ant colony optimization ACO.

Keywords: *optimization, genetic algortihm, particle swarm optimization, ant colony optimization*

SAŽETAK:
Optimizacija elastičnih sistema je područje u kojem je istraživanje intenzivirano posljednjih nekoliko decenija. Temeljna i najintenzivnija istraživanja u početku su bila na bazi numeričkih metoda. U optimizaciji sistema, posljednjih dvije decenije došlo je do razvoja bioinspirativnih metoda. Ove metode su našle posebno mjesto u optimizaciji elastičnih struktura. U ovom radu predstavljamo tri bio inspirativne metode koje se sve više koriste u optimizaciji elastičnih struktura a to su: genetski algoritmi, optimizacija rojem čestica i optimizacija kolonijom mrava.

Ključne riječi: *optimizacija, genetski algoritmi, optimizacija rojem čestica, optimizacija kolonijom mrava.*

COMPARATIVE ANALYSIS OF GRADIENT AND HEURISTIC METHODS IN CANTILEVER BEAM OPTIMIZATION

UPOREDNA ANALIZA GRADIJENTNIH I HEURISTIČKIH METODA KOD OPTIMIZACIJE KONZOLE

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ABSTRACT:
In this paper an example of cantilever beam optimization is given. First, basic principle of analytical dimensioning of cantilever beam is presented and then move on to dimensioning by finite elements. A way of finding minimal weight of cantilever beam was established which directly led to optimization to find best solution. A concrete example of cantilever beam which was optimized with four methods: nonlinear programming, genetic algorithm, particle swarm optimization and ant colony optimization is give. At the end of the paper, results was compared and analyzed.

Keywords: *cantilever beam, optimization, genetic algorithm, particle swarm optimization PSO, ant colony optimization ACO.*

SAŽETAK:
U ovom radu dat je primjer optimizacije konzole. Prvo je predstavljen osnovni princip dimenzionisanja analitičkim putem a zatim prelazak na dimenzionisanje konačnim elementima. Utvrđen je način pronalaska minimalne težine konzole, što je direktno dovelo do optimizacije čiji je osnovni cilj pronalazak najboljih rješenja. Dat je konkretan primjer konzole koju smo optimizirali sa četiri metode: nelienernim programiranjem, genetskim algoritmima, rojem čestica i kolonijom mrava. Na kraju rada smo uporedili i analizirali dobijene rezultate.

Ključne riječi: *konzola, optimizacija, genetski algoritmi, optimizacija rojem čestica, optimizacija kolonijom mrava.*

THE APPLICATION OF ROBOTS IN MEDICINE

PRIMJENA ROBOTIKE U MEDICINI

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ABSTRACT:
This paper presents a history of the development and current achievements in the field of application of robots in medicine with a special focus on robotic neurosurgery. Presented are positive and negative aspects of application of robots in medicine. In the paper is also a detailed description of the robotic system for neurosurgery RONNA used from the author or this paper. Described is the operation mode where a series of photographs visualizes applied solutions. RONNA system is in clinical trials from which we expect to give us guidelines for the further development and for the harmonization with the environment in the operating room. The paper presented the view of the author on the future development of robots in surgery and neurosurgery in particular, as well as the current trends in the development of micro- and nano- robots in medicine, intended to perform medical interventions within the patient's body.

Keywords: *medical robots, neurosurgical robots, system RONNA, medical micro-robots*

SAŽETAK:
U radu je prikazana povijest razvoja, te postojeća dostignuća na polju primjene robota u medicini s posebnim osvrtom na robotsku neurokirurgiju. Prikazane su dobre i loše strane primjene robota u medicini. Posebno je detaljnije opisan robotski sustav za neurokirurgiju RONNA na kojem radi i autor. Opisan je način rada, a nizom fotografija pobliže vizualno prikazana izvedena rješenja. Sustav RONNA je u fazi kliničkih ispitivanja od kojih se očekuju daljnje smjernice razvoja i usklađivanja s okruženjem u operacijskoj sali. Prikazano je viđenje autora o budućem razvoju robota u kirurgiji i posebno neurokirurgiji, te prisutne trendove u razvoju mikro i nano robota u medicini, namijenjene obavljanju medicinskih zahvata unutar tijela pacijenta.

Ključne riječi: *medicinski roboti, neurokirurški roboti, sustav RONNA, medicinski mikro roboti*

FRACTURE MECHANICS PARAMETERS DETERMINATION FOR STRUCTURAL STEEL MINING MACHINES – EXPERIMRNTAL AND NUMERICAL METHODS

ODREĐIVANJE PARAMETARA MEHANIKE LOMA ZA KONSTRUKCIONI ČELIK RUDARSKIH POSTROJENJA – EKSPERIMENTALNE I NUMERIČKE METODE

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ABSTRACT:
Fracture properties of the S355 steel used in the construction of mining equipment were investigated by experimental and numerical methods in the paper. The experimental investigations were conducted on standard SENB specimens according to ASTM E 1820 from which change of J-integral values with load increase and crack length were determined. Apart from the standard calculation, J-integral values were calculated from the relationship with the crack tip opening displacements (CTOD) which were determined by stereometric deformation measurements. Finite element method (FEM) numerical simulations were performed based on the experimental set-ups and results, where J-integral values were determined using energy domain integral method. The experimental and the numerical results were compared.

Keywords: *J-integral, Fracture Mechanics, SENB specimen, Finite Element Method, S355 Steel, Stereometric Measurements*

SAŽETAK:
U radu su ispitivane lomne osobine čelika S355 koji se primjenjuje u konstrukciji rudarskih postrojenja pomoću eksperimentalnih i numeričkih metoda. Eksperimentalna istraživanja su obavljena na SENB epruveti prema ASTM E 1820 na osnovu kojih je određena promjena vrijednosti J-integrala sa prirastom sile i dužinom pukotine. Osim na osnovu proračuna iz standarda, J-integral je proračunat i na osnovu korelacije sa otvaranjem vrha pukotine (CTOD) određene stereometrijskim mjerenjem deformacija. Na osnovu eksperimentalne postavke i rezultata su napravljene numeričke simulacije primjenom metode konačnih elemenata (MKE), gdje je J-integral određen metodom integrala energijske domene. Eksperimentalni i numerički rezultati su upoređeni.

Ključne riječi: *J-integral, Mehanika loma, SENB epruveta, Metoda konačnih elemenata, S355 čelik, stereometrijsko mjerenje*

APPLICATION OF CARBON FIBRE IN CONSTRUCTION INDUSTRY

PRIMJENA KARBONSKIH VLAKANA U GRAĐEVINARSTVU

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ABSTRACT:
The paper shows the possibility of the application of carbon fiber in the construction industry. The introductory section provides basic information about carbon fiber, fiber types and the products made from them. After introductory part, the area of the use of carbon fiber in the construction industry is indicated: the use of carbon fiber in reinforced concrete, the use of carbon fibers in wood structures and application of composite plastic profiles and carbon fibers. Based on good practice, this paper shows the application of CFRP strips as reinforcing elements for construction.

Keywords: *carbon strips, carbon fabric (Wrap), carbon plates (CFRP), epoxy adhesives*

SAŽETAK:
U radu je ukazano na mogućnosti primjene karbonskih vlakana u građevinarstvu. U uvodnom dijelu dati su osnovni podaci o karbonskim vlaknima, vrstama karbonskih vlakana koje se koriste i proizvodima od njih. Nakon uvodnog dijela, ukazano je na oblasti upotrebe karbonskih vlakana u građevinarstvu: upotreba karbonskih vlakana u armiranom betonu, upotreba vlakana u drvenim konstrukcijama i primjena kompozita od plastičnih profila i karbonskih vlakana. Na primjeru iz prakse u radu je prikazana primjena karbonskih traka kao elemenata za ojačanje konstrukcija.

Ključne riječi: *karbonska traka, traka-tkanina, traka-laminat, epoksidno ljepilo*

NUMERICAL MODEL OF THE BRANCH IN A PIPELINE AT HP PERUCICA

NUMERIČKI MODEL RAČVE CJEVOVODA HE PERUĆICA

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ABSTRACT:
The results of numerical modeling of the branch A6 in the pipeline C3 in HP „Perućica" are presented in this paper. Given results are compared with the numerical and experimental results obtained on the model of the branch. Geometric model of the branch is made in commercial software for the computer design. Critical spots in the branch are identified. It is shown that analysis of the branch model can replace with sufficient accuracy analysis of the real branch, so that all further experimental investigations can be done on the model. Starting value of pressure for which the numerical model is done was of 10 bars.

Keywords: *branch, numerical modeling, CAD*

SAŽETAK:
U radu su dati rezultati numeričkog modelovanja račve A6 cjevovoda C3 u HE „Perućica". Dobijeni rezultati su upoređeni sa numeričkim i eksperimentalnim rezultatima dobijenim analizom modela račve. Geometrijski model račve je napravljen primjenom komercijalnog softvera za kompjutersko projektovanje. Identifikovana su kritična mjesta na račvi. Pokazano je da analiza modela račve može zamijeniti sa dovoljnom tačnošću analizu realne račve tako da se sva dalja eksperimentalna ispitivanja mogu obavljati na modelu Početna vrijednost pritiska za koji je rađen numerički model bila je 10 bara.

Ključne riječi: *račva , numeričko modelovanje, CAD*

PARAMETERS IN DESIGN AND CALCULATION OF MEASUREMENT UNCERTAINTY OF CORIOLIS FLOW-METER

PARAMETRI PRILIKOM IZBORA I PRORAČUN MJERNE NESIGURNOSTI CORIOLISOVIH MJERILA PROTOKA

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ABSTRACT:*All the more stringent requirements of end-users, the constant advancement of science, engineering and technology necessitated the use of reliable, long lasting instruments and devices for their time looking for work as lower maintenance costs. Instruments mentioned herein may be in any kind of industry, while it is expressed in the metrology industry, which is cream and sublimation of many knowledge, physical law and engineering. In the metrology industry that deals with measurement of fluid flow, especially on main lines of which are situated in difficult access areas, sites with accompanying instruments are increasingly such that require minimal maintenance, of course, with follow-up results of measurements from a distance. Such instruments must be reliable, durable and easy to maintain and eventual replacement. Today more and more often it is possible on measuring places, flowmeter based on the Coriolis force. In this paper, important parameters for proper design and selection of a certain flow meters, will be presented. Beside, basic of measurement uncertainty will be presented under condition where is measurement passes is relatively low as well as basic information about appearing of Coriolis force and basic information about Coriolis mass flow meter.*

Keywords: *Flowmeter selection, Coriolis mass flow meter, Measurement uncertainty*

SAŽETAK:*Sve strožiji zahtjevi krajnjih korisnika, stalnim napretkom nauke, tehnike i tehnologije uslovili su korištenje pouzdanijih, dugotrajnijih instrumenata i uređaja koji za svoje vrijeme rada traže što manje troškove održavanja. Instrumenti koji se spominju mogu biti u bilo kojoj grani industrije, dok je to izraženo u industriji mjeriteljstva, koja je krema i sublimacija mnogih znanja, zakona i tehnika. U industriji mjeriteljstva koje se bavi mjerenjem protoka fluida, pogotovo na magistralnim i glavnim vodovima koji se uglavnom nalaze na teže pristupnim mjestima, mjerna mjesta sa pripadajućim instrumentima su sve češće takva da zahtjevaju minimalno održavanje, naravno uz praćenje rezultata mjerenja sa distance. Takvi instrumenti moraju biti pouzdani, izdržljivi te laki za održavanje i eventualnu zamjenu. Danas sve češće na mjernim mjestima vidimo mjerilo na bazi Coriolisove sile. U okviru rada biće prikazani uticajni parametri za izbor određenog mjerila protoka. Pored toga, biće date osnove proračuna mjerne nesigurnosti kalibracije gdje je broj mjerenja relativno mali kao i osnovne informacije o pojavi Coriolisove sile i osnovnim pojmovima o Coriolisovom mjerilu protoka.*

***Ključne riječi*:** *Izbor mjerila protoka, Coriolisovo mjerilo, Mjerna nesigurnost*

PREGLED MEHATRONIČKIH SISTEMA ZA POMOĆ VOZAČU PRI VOŽNJI VOZILA
THE MECHATRONICS SYSTEMS FOR DRIVER ASSISTANCE OVERVIEW

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ABSTRACT:
In this paper, an overview of the design, the architecture and functionality of today's mechatronics' vehicle control systems is given focusing on the levels of automation systems to support the driver. Today, in modern vehicles there are approximately 100 microcomputers providing service to the driver by means of vehicle operation, comfort, assistance and safety. Electronics control almost every function inside the vehicle and there are attempts to harmonise vehicle-to-vehicle communication (V2V) and vehicle-to-infrastructure information exchange (V2I) as well. Advanced driver assistance systems (ADAS) take over more and more complex and complicated tasks from the driver like adaptive cruise control (ACC) or lane keeping assistance (LKA). The trend is that with new features and improved sensors world's leading companies (Bosch, Mercedes, Volvo, itd.) support this step forward in the coming years. In order to improve and update these supplies emphasis not only on the development of new systems, but also on mutual merging existing, thus creating new functions. These functions include, enabling driving with foresight, as well as facilitate the driver to use in certain situations. All mechatronic systems are developed with one goal - to model the intelligent vehicle or a vehicle that will completely autonomously perform driving passengers.
Keywords: *vehicle, mechatronics system, automation levels, sensor, intelligent vehicle*

SAŽETAK:
U ovom radu dat je kratak pregled dizajna, arhitekture i funkcionalnosti današnjih mehatroničkih sistema kontrole nad vozilima s naglaskom na nivoe automatizacije sistema za podršku vozaču. U modernim vozilima danas postoji u prosjeku oko 100 mikroračunara koji vozaču pomažu pri upravljanju vozilom i koriste se u sistemima sigurnosti, pomoći i udobnosti. Kontrola gotovo svake funkcije unutar vozila je sve više elektronizirana, a savremeni trendovi idu u smjeru pokušaja da se ostvari komunikacija vozilo-vozilo (vehicle-to-vehicle communication–V2V) i razmjena informacija na relaciji vozilo-infrastruktura (vehicle-to-infrastructure information exchange-V2I). Napredni sistemi za pomoć vozaču (Advanced driver assistance system - ADAS) sve više preuzimaju složenije i komplikovanije zadatke od vozača kao sistem za održavanje smjera kretanja vozila (Adaptive Cruise Control - ACC) ili sistem za održavanje vozila na saobraćajnoj traci (Lane Keeping Assistance - LKA). Trend je da s novim funkcijama i poboljšanim senzorima vodeće svjetske kompanije (Bosch, Mercedes, Volvo, itd.) podržavaju ovaj iskorak i u narednim godinama. U svrhu poboljšanja tih pomagala akcent nije samo na razvoju novih sistema, nego i na međusobnom spajanju postojećih, čime se stvaraju nove funkcije. Te funkcije uključuju, npr. omogućavanje vožnje s predviđanjem, pa i olakšavaju vozaču vožnju u određenim situacijama. Svi mehatronički sistemi koji se razvijaju imaju jedan cilj, a to je modelirati inteligentno vozilo, odnosno vozilo koje će potpuno autonomno vršiti vožnju putnika.
Ključne riječi*: vozilo, mehatronički sistem, nivoi automatizacije, senzor, inteligentno vozilo*

EXPERIMENTAL DETERMINATION OF DYNAMIC DAMPING COEFFICIENT DISC SAW FOR HOT PROFILE CUTTING

EKSPERIMENTALNO ODREĐIVANJE DINAMIČKOG KOEFICIJENTA PRIGUŠENJA PILNOG DISKA ZA ODSIJECANJE PROFILA U VRUĆEM STANJU

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ABSTRACT: *Dynamic parameters: natural frequency, damping and modal forms, functions are the global stiffness and the best indicator of the real state of the structure. For reliable determination of damping for individual elements or entire systems it is necessary to apply the experimental measurements. The target paper is to confirmation assumption to be in a continuous process of rolling steel profiles, in the period between the two cut-off profile in the hot state can achieve vibration damping disc saw, ensuring stability following the cut in the course of time working machining center. In order to assess the speed of vibration damping it were seen two consecutive amplitude. With electronic measuring system HBM Spider 8 for personal computers were carried out electrical measurement of mechanical variables such as deformation, force, shift and acceleration. Of other measuring equipment in the experiment were used: uniaxial strain gage 10/120 LY11 as force sensor, sensor shift type HBM WA100, as well as acceleration sensors METRIX type SA6200B fixed on the body of the disc in the area of expected major deformation and outside that zone. Measurements were carried out in pilot plant scale at room temperature, and tests are carried out at different striking forces with different number of teeth disc saw which are interact with the profile.*
Keywords: *disc saw, vibrations, damping*

SAŽETAK: *Dinamički parametri: sopstvene frekvencije, prigušenja i modalni oblici, funkcije su globalne krutosti i najbolji su pokazatelj realnog stanja konstrukcije. Za pouzdano određivanje karakteristika prigušenja za pojedine elemente ili cijele sisteme nužno je primjeniti eksperimentalna mjerenja.Cilj rada je potvrđivanje pretpostavke da se u kontinuiranom procesu valjanja čeličnih profila, u periodu između dva odsijecanja profila u vrućem stanju može postići prigušenje vibracija pilnog diska, čime se osigurava stabilnost slijedećeg reza u toku vremena rada obradnog centra. Da bi se ocijenila brzina prigušenja vibriranja posmatrane su dvije uzastopne amplitude. Elektronskim mjernim sistemom Spider 8 HBM za personalne računare vršena su električna mjerenja mehaničkih varijabli kao što su: deformacija, sila, pomjeranje i ubrzanje. Od ostale mjerne opreme u eksperimentu su korišteni: jednoosna mjerna traka 10/120 LY11 kao senzor sile, senzor pomjeranja HBM tip WA100, kao i senzori ubrzanja METRIX tip SA6200B fiksirani na tijelu diska u zoni očekivanih najvećih deformacija i izvan te zone. Mjerenja su provedena u poluindustrijskim uslovima na sobnoj temperaturi, a testiranja su izvedena pri različitim udarnim silama sa različitim brojem zubaca pilnog diska koji su u interakciji sa profilom.*
Ključne riječi: *pilni disk, vibracije, prigušenje*

MECHATRONIC SYSTEM DEVELOPMENT FOR HYDROFORMING OF A TUBES

RAZVOJ MEHATRONIČKOG SISTEMA ZA HIDROOBLIKOVANJE CIJEVI

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ABSTRACT:
This paper summarizes the design, description, appearance and functionality components to automate the process of forming tubes using a fluid under high pressure (hydroforming). Hydroforming process is cost-effective process of shaping the pipes from materials such as aluminum, brass, steel. Even complicated shapes can be formed usually in a single step. The most common use of this method is in the automotive, aerospace industry, production of medical equipment, etc. where hydroforming can answer the need of creating pieces of complex shapes in a simple way and at an affordable price. Different materials are formed at different pressures and pressures also have a different time intervals. The design of hydroforming presses is a modern design that allows easy processing and computer process control. Modern trends go towards the sensory control of almost every parameter, and use this information in the decision-making process. To control the process, it is necessary to monitor the pressure of fluid in the tool design, the pressure which is necessary to achieve that starts the process, the duration of the reached pressure, the force with which the tool paths, deformation of the material, and this will be achieved by means of the pressure and the displacement sensor using the appropriate software.

Keywords: *hydroforming, automation, sensor control, design, computer control.*

SAŽETAK:
U ovom radu dat je kratak pregled dizajna, opis, izgled i funkcionalnost komponenti za automatizaciju procesa oblikovanja cijevi korištenjem fluida pod visokim pritiskom (hydroforming). Hydroforming proces je ekonomičan proces kojim oblikujemo cijevi od materijala kao što su aluminij, mesing, čelik. Čak i komplikovani oblici se mogu oblikovati obično u jednom koraku. Najčešća primjena ove metode jeste u automobilskoj, avio industriji, proizvodnji medicinske opreme i sl. gdje hydroforming može odgovoriti potrebi oblikovanja komada složenih oblika na jednostavan način i po pristupačnoj cijeni. Različiti materijali se oblikuju na različitim pritiscima i ti pritisci također traju različit vremenski interval. Dizajn hydroforming prese jeste moderan dizajn koji omogućuje lako i jednostavno rukovanje i računarsko upravljanje procesom. Savremeni trendovi idu prema senzorskoj kontroli gotovo svakog parametra, te korištenju tim informacija u procesu odlučivanja. Za kontrolu procesa potrebno je pratiti pritisak fluida u alatu za oblikovanje, pritisak kojeg je potrebno dostići da počne proces, vremena trajanja dostignutog pritiska, sile kojom stežemo alat, te deformaciju samog materijala, a to ćemo postići pomoću senzora pritisaka i pomaka, uz korištenje odgovarajućeg softvera.

Ključne riječi: *hydroforming, automatizacija, senzorska kontrola, dizajn, računarsko upravljanje.*

INSURANCE REQUIREMENT FOR STABILITY BUCKET WHEEL EXCAVATOR IN THE RECONSTRUCTION OF VITAL ELEMENTS EXCAVATOR

OSIGURANJE ZAHTIJEVANE STABILNOSTI ROTORNOG BAGERA PRI REKONSTRUKCIJI VITALNIH ELEMENATA BAGERA

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ABSTRACT:

The paper analyzes the changes in weight distribution of the upper revolving platform bucket wheel excavator SRs-220 9,5/0,5 after replacing the engine for driving the wheel. It presents the results of the analytical calculation of the mass center of the upper structure of the platform as well as the results of in situ measurements. In addition, determined the size you move the center of mass of the upper revolving platform excavator installed with the old and then the new engine in driving the body, in the case of static and dynamic loads at one of the border position of the working bodies of the bucket wheel excavator. It was noted that after the revitalization of the vehicle bucket wheel excavator is necessary to determine the position of the center of mass of the bucket wheel excavator in order to ensure the required stability of the excavator.

Keywords: *upper craft platform, bucket wheel excavator, stability of the structure*

SAŽETAK:

U radu je analizirana promjena rasporeda masa gornje obrtne platforme rotornog bagera SRs-220 9,5/0,5 nakon zamjene motora za pogon radnog točka. Pri tome su prezentirani rezultati analitičkog proračuna centra masa konstrukcije gornje obrtne platforme kao i rezultati provedenih in situ mjerenja. Pored toga, utvrđena je veličina pomijeranja centra masa gornje obrtne platforme bagera sa instaliranim starim a zatim i novim motorom za pogon radnog organa i to za slučaj statičkog i dinamičkog opterećenja pri jednom od graničnih položaja radnog organa rotornog bagera. Konstatovano je da je nakon revitalizacije pojedinih sklopova rotornog bagera neophodno utvrditi položaj centra masa rotornog bagera kako bi se osigurala zahtijevana stabilnost bagera.

Ključne riječi: *gornja obrtna platfotma, rotorni bager, stabilnost konstrukcije*

STUDY ABOUT IMPROVING THE WORKING SOLUTION AT THE METAL PROCESSING BY ELECTROCHEMICAL AND ELECTRICAL DISCHARGES

STUDIJA O POBOLJŠANJU RJEŠENJA U OBRADI METALA KORIŠTENJEM ELEKTROHEMIJSKIH I ELEKTRIČNIH PRAŽNJENJA

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ABSTRACT: *At the processing by electrical complex erosion sodium silicate can be substituted with mixture of inorganic solutions and colloidal solutions as working medium. They promote the anodic dissolution as well as the electrical discharges increasing the process efficiency. In this paper will be analyzed the mixture of inorganic solutions with colloidal ones, in which there have been obtained the best results.*

Keywords*: sodium silicate, anodic dissolution, Monofactorial Dispersion Analysis*

CONCLUSION

From these graphics it can be concluded that the process effciency is significantly influenced by the type of the working solution;
- the best process efficiency for the steel S6-5-3 and X210Cr12 was obtained in sodium silicate 30% + kaolin 10% + $NaNO_3$ 5% (sol.1)

From the proposed working solutions the best advantages presents the colloidal suspension of silicate 30% + kaolin 10% + $NaNO_3$ 5% because:

- the rate of material removing from the work-piece is high, due to the sodium silicate in excess;
- decreases the pellicle adherence on the processing object and on the working tool surface because a part from the adhesion forces are for bonding the kaolin micelle;
- increase the solution electrical conductivity, respectively the anodic dissolution because of the electrolyte solution.

At the processing by electrochemical and electrical discharges in colloidal suspension of silicate and kaolin, the material removing takes place more by electrical discharges than by anodic dissolution and the work-piece surface will have a great roughness.
The colloidal working solutions intensified the processing rate as well as the process efficiency, in inorganic solutions these parameters are lower and also exists the possibility of a short circuit between the electrodes.

A CONTROL-THEORETIC APPROACH TO ASCERTAIN HUMAN POSTURAL CONTROL MODEL

TEORIJSKI KONTROLIRANI PRISTUP KONSTATOVANJU LJUDSKOG USTANOVLJENOG KONTROLNOG MODELA

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ABSTRACT: *Although classically-adopted PID-cascade postural control schemes are adequate for describing effects of external disturbances acting on upright stance, it is shown in this article that they fall short to address the issue of voluntary motion due to the inherent instability of uncontrolled upright posture. A novel alternative, "hybrid cascade-feedback scheme," is presented and shown to be equivalent to the PID-cascade scheme in terms of external disturbances but overcome its shortcomings related to voluntary motion. This proposed scheme is based on a well-established robust tracking and disturbance rejection control method. It can be modularly extended to cover multi-input-multi-output scenarios through employing state-space tools.*

Keywords: *posture control, voluntary motion, disturbance rejection, PID control, cascade compensation, feedback compensation*

DISCUSSION: *Experimental simulation results show the merits of the novel proposed scheme in modeling human posture control. This scheme is perfectly equivalent to the classical PID-cascade scheme, which is the core of the majority of published models, regarding the description of postural control response to external disturbances. External disturbances have been intensively employed to identify human postural control mechanisms. The predictions of a PID-cascade scheme for voluntary motion has neither been experimentally investigated nor simulated so far. To this extent, the proposed model constitutes a better alternative to the classical PID-cascade scheme in coping with voluntary motion.The proposed hybrid scheme, which is explained by splitting the PID compensator into two compensators, is in fact equivalent to a well-known technical control method. It represents a well-studied architecture for robust tracking and disturbance rejection based on the internal model principle [4], [7]. It is technically proven that such an architecture enables for tracking input step functions robustly even in the presence of process parametric changes and it is capable of rejecting a certain class of external disturbances acting on the process. Here, the inverted-pendulum model represents a single-input-single-output (SISO) system where the single input is the applied torque at the ankle joint and the single output is the body-in-space angle. In this case, the robust tracking and disturbance rejection method translates exactly to the presented hybrid cascade-feedback scheme..*

Based on the assumptions and results of this study, some predictions regarding experiments on voluntary motion can be made. If the PID-cascade scheme is in deed not the one adopted by the central nervous system, then the body response to voluntary motion will exhibit either a very small or no overshoot with a reasonably short settling time. The amount of overshoot and settling time depend on the three control gains as detailed. This study motivates new experimental investigations regarding voluntary motion to distinguish between the two discussed schemes.

WIND POWER PLANTS AS ALTERNATIVE SOURCES OF RENEWABLE ENERGY

VJETROELEKTRANE KAO ALTERNATIVNI IZVORI OBNOVLJIVE ENERGIJE

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ABSTRACT:
In this paper operating and development of wind power plants, as one of the most prospective ecological renewable energy sources, is analised. It analyzes the technical components of wind power, types of turbinesand electrical generators, the criteria for selecting sites on which to build. Besides economic and environmental advantages. The problems of stability on connecting to the electrical network is adressed.

Keywords: *wind powerplants, turbines, generators, electric network*

SAŽETAK:
U radu se analizira rad i razvoj vjetroenelektrana, kao jednog od najperspektivijih alternativnih obnovljivih izvora energije koji ne zagađuje sredinu. Analizirane su tehničke komponente vjetroelektrane, vrste turbina, tipovi elektrčnih generatora, kriterijumi za odabiranje mjesta na kojima se grade. Sem ekonomske i ekološke opravdanosti ukazano je na probleme stabilnosti pri vezivanju na distributivnu mreužu.

Ključne riječi: *vjetroelektrane, turbina, električni generatori, električna mreža*

WATER, ENERGY AND FOOD - KEY DRIVERS FOR BIH EXIT FROM CRISIS

VODA, ENERGIJA I HRANA – KLJUČNA ŠANSA BiH ZA IZLAZAK IZ KRIZE

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ABSTRACT:
A perennial political and economic, but also social crisis in Bosnia and Herzegovina can be overcome by wise use of existing natural and social resources. Water use in BiH is at very low level, while the prices of energy and food will certainly grow at local and at the European and world market in the long run. Key chance for BiH lies within huge potential for development of water use in energy and food production. Why then are we not progressing, or are even becoming poorer? Can't the intellectual elite offer solutions for the entire population of Bosnia and Herzegovina, but also for itself? Can we not project our own future for the next 10 or 15 years? What is the obligation of science, if not to find and offer solutions even when it seems that they do not exist? Controversial political issues should be put aside, a key development lead to the foreground.

Key words: *Science, Resources, Poverty, Potentials, Development*

SAŽETAK:
Višegodišnja politička i ekonomska, ali i društvena kriza u BiH može se prevladati mudrim korištenjem postojećih prirodnih i društvenih resursa. Korištenje voda u BiH je na veoma niskom nivou, a cijene energije i hrane će lokalno, te na evropskom i na svjetskom tržištu dugoročno sigurno rasti. Ključna šansa BiH je u ogromnom potencijalu za razvoj korištenja voda u proizvodnji i energije i hrane. Zašto onda stojimo u mjestu ili još više siromašimo?Zar intelektualna elita ne može ponuditi rješenja za cjelokupno stanovništvo BiH, pa i za sebe? Zar ne možemo projicirati svoju budućnost u narednih 10 ili 15 godina? Šta je obaveza nauke, ako ne da pronađe i ponudi rješenja i kada izgleda da ih nema? Sporna politička pitanja treba ostaviti po strani, a ključna razvojna dovesti u prvi plan.

Ključne riječi: *Nauka, Resursi, Siromaštvo, Potencijali, Razvoj*

STATUS OF MACHINE PARTS FOR RENEWABLE ENERGY SOURCES IN B&H

STATUS STROJNIH DIJELOVA ZA OBNOVLJIVE IZVORE ENERGIJE U BiH

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ABSTRACT:
Modern foundry technology ensures the quality and efficiency of machine parts, manufactured from ductile cast iron, and whose volume of production in the world is constantly increasing. At the same time in B&H does not contracting authorities concerned to produce castings from nodular cast iron, and especially not for machines for renewable energy. Analysis foundry capacities shows that foundry industry in B&H could still produce such castings and weight over 25 t, some of which are already B&H castings and built-in facilities for wind farms abroad. The energy ecology imposed huge modern power plants based on wind and with which construction B&H will be faced. Delays or inability to manufacture the said machine will suppress the global market foundry and all branches of the metal industry in B&H.
Home Research and unique production of castings show that it is now in B&H, it is possible to produce castings for wind power plants and other energetic plants.

Keywords :*machine parts, castings, ductile iron, windenergy*

SAŽETAK:
Moderna ljevarska tehnologija osigurava kvalitet i ekonomičnost strojnih dijelova, proizvedenih iz nodularnog ljeva, a čiji obim proizvodnje u svijetu se stalno povećava. Istovremeno u BiH nema zainteresiranih naručilaca za proizvodnju odljevaka od nodularnog ljeva, a posebno ne za strojeve za obnovljive izvore energije. Analiza ljevarskih kapaciteta pokazuje da bi ljevarska industrija u BiH još uvijek mogla proizvoditi takve odljevke mase i preko 25 t, od kojih su neki BiH odljevci već i ugrađeni u postrojenja za vjetroelektrane u inostranstvu. U energetici ekologija je nametnula ogromna savremena energetska postrojenja na bazi vjetra i sa čijom gradnjom će i BiH biti suočena.
Zaostajanje ili nemogućnost proizvodnje spomenutih strojnih će potisnuti sa svjetskog tržišta ljevarsku i sve grane metalne industrije BiH.
Početna istraživanja i unikatna proizvodnja odljevaka pokazuju, da je i sada u BiH, moguće proizvesti lijevane dijelove za vjetroelektrane i neka druga enegetska postrojenja.

Ključne riječi: *strojni dijelovi, odljevci, nodularni ljev, vjetroelektrane*

BIOMETHANE AS BIOFUEL

BIOMETAN KAO GORIVO

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ABSTRACT:

Biomethane is becoming more and more competitive compared to fossil fuels. The raw material for the production of biomethane is biogas. Biogas is produced from nearly all types of organic materials including vegetable and animal feedstocks. It is produced by means of anaerobic digestion. Obtained biogas has to be further processed and cleaned in order to receive biomethane which is suitable for transport applications. Today, there are many different technologies and digester types available. Generally, the size of biogas plants can vary from a small household system to large commercial plants of several thousand cubic meters. Biogas is a combination of methane and carbon dioxide, typically in the ratio of 6:4 (55-80 % methane). Since only the methane is usable as transport fuel, methane has to be separated from CO2 and the remaining components of biogas. The final product is biomethane, which has methane content between 95 and 100%.

The use of biomethane has several positive and comfortable side effects to humans such as far less odors are emitted than if animal manure is collected in open storage facilities, vehicles running on biomethane are generally not as noise intensive as other vehicles.

Keywords: *biogas,biomethane, biofuels, digester, anaerobic digestion*

SAŽETAK:

Biometan kao gorivo postaje sve više i više konkurentan u poređenju sa fosilnim gorivima. Kao sirovina za proizvodnju biometana koristi se biogas. Biogas se dobija gotovo iz svih organskih materija biljnog ili životinjskog porijekla postupkom anaerobne digestije. Dobijeni biogas mora dalje biti obrađen i prečišćen u nastojanju da se proizvede biometan. Trenutno postoji više različitih tehnologija dobijanja biometana, odnosno biogasa u različitim vrstama digestora. Uopšteno, veličina postrojenja za biogas može varirati od malih kućnih postrojenja pa sve do velikih komercijalnih postrojenja zapremine od nekoliko hiljada kubnih metara. Biogas se sastoji od metana i ugljendioksida najčešće u odnosu 6:4 (55 – 80% metana). Pošto se samo metan može primijeniti kao motorno gorivo, metan mora biti odvojen od CO_2 i ostalih komponenti koje su prisutne u biogasu. Krajnji produkt je biometan koji ima sadržaj metana između 95 i 100%.

Korištenjem biometana postiže se manja emisija neprijatnih mirisa koji bi se stvarali ukoliko bi se životinjski izmet sakupljao na otvorenim površinama. Vozila koja koriste biometan kao svoje gorivo proizvode manju buku od ostalih vozila.

Ključne riječi*: biogas, biometan, biogoriva, digestor, anaerobna digestija*

DYNAMIC COMPLEXITY OF RENEWABLE AND NONRENEWABLE ENERGY RESOURCES

DINAMIKA SLOŽENOST OBNOVLJIVIH I NEOBNOVLJIVIH IZVORA ENERGIJE

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ABSTRACT:
Resource problems of energy are linked to the economic, environmental and social systems. On current trends, humanity will need twice as much energy as it uses today within 35 years. In this paper substitution of nonrenewable (dirty) with renewable (clean) energy sources, is analyzed. This substitution will lead to very complex and positive consequences and perspectives - the main pollutants (coal, oil, gas) will be eliminated, the problem of greenhouse effect with warming of the Earth and changing of climate too. As a consequence – this replacement will lead to better health (lower cost of treatment and medications), higher live expectancy, bigger and more productive labor force (less absence from work), bigger productivity, etc.

Keywords: *nonrenewable, renewable, sources energy, solar, wind, alternative sources*

SAŽETAK:
Problemi energetskih resursa su povezani sa ekonomskim, ekološkim i socijalnim sistemima. Na osnovu tekućih trendova čovječanstvu će trebati kroz 35 godina dva puta više enrgije nego danas. U članku se obrađuje zamjena neobnovljivih (prljavih) izvora energije sa obnovljivim (čietim) izvorima. Ova zamjena vodi vrlo kompleksnim i pozitivnim posljedicama i perspektivama – eliminaciji glavnih zagađivača (ugalj, nafta, gas), efekta staklene bašte sa pregrijavanjem planete kao i katastrofičnih klimatskih promjena. Takođe, zamjena vodi boljem zdravlju, manjim troškovima liječenja, dužem životnom vijeku,većoj i produktivnijoj radnoj snazi (manje odsustva sa posla), itd.

Klučne riječi*:neobnovljivi, obnovljivi, izvori energije, sunčeva, vjetra, alternativni izvori*

RES/EE IN ENVIRONMENTAL PROTECTION

OIE/EE U ZAŠTITI OKOLIŠA

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ABSTRACT:
Renewable energy sources (RES), energy efficiency (EE) and the protection of the environment are topics of much discussion in the world today. The European union through the plan 20-20-20 by 2020 set the objectives of its members to the 20% increase the use of renewable energy sources by 2020. One of the goals is to reduce the greenhouse gases by 20%, and it is renewable energy sources play a very important role in reducing carbon dioxide emissions into the atmosphere and the environment. Their use is increasing and energy sustainability. The renewables include: solar energy, wind energy, hydropower, energy from waste, geothermal energy. Especially important renewable energy source is energy from waste, which by applying energy principles for efficient use can be economically justified in a humane approach that provides treatment free waste disposal. Treatment of waste through energy valorization provides benefits that will solve the problem of the growing energy needs of mankind, but also a problem for large amounts of biomass. The correct treatment of waste should be environmentally friendly, energy efficient, healthily - suitable, sanitary - hygienic correct, economically profitable and sustainable development.
Key words: *renewable energy, energy efficiency, environment, waste.*

SAŽETAK:
Obnovljivi izvori energije (OIE), energetska efikasnost (EE) kao i zaštita okoliša su teme o kojima se mnogo raspravlja danas u svijetu. Evropska unija kroz plan 20-20-20 do 2020. godine postavila je svojim članicama ciljeve da se za 20% poveća upotreba obnovljivih izvora energije do 2020. godine. Jedan od ciljeva je da se i staklenički plinovi smanje za 20%, a upravo obnovljivi izvori energije imaju vrlo važnu ulogu u smanjenju emisije ugljendioksida u atmosferu i zaštite okoliša. Njihovom upotrebom povećava se i energetska održivost. U obnovljive izvore spadaju: energija sunca, energija vjetra, hidroenergija, energija iz otpada, geotermalna energija. Posebno bitan obnovljivi izvor energije je otpad koji se uz primjenu energetskih načela za efikasno korištenje može ekonomski opravdati kroz humani pristup koji osigurava tretman bez odlaganja/deponiranja. Tretman otpada kroz energetsku valorizaciju osigurava benefite kojima se može riješiti problem rastuće energetske potrebe čovječanstva, ali i problem velikih količina otpada koji se odlaže/deponira. Korektni tretman otpada treba biti ekološki prihvatljiv, energetski efikasan, zdravstveno podoban, sanitarno – higijenski ispravan, ekonomski profitabilan i razvojno održiv.

Ključne riječi: *Obnovljivi izvori energije, energetska efikasnost, okoliš, otpad.*

CIRKULARNA EKONOMIJA U NAPREDNIM TEHNOLOGIJAMA

CIRCULAR ECONOMY IN ADVANCED TECHNOLOGIES

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ABSTRACT :
The Europe 2020 Strategy is one of the best ways in which the EU, through public policy, is trying to implement the laws of formal and informal institutions. We talk about the implementation of circular economy on the ground of countries that are ready for this kind of reforms. Circular economy would have the task of dealing with existing waste, by selection and recycling the components that have been useful and useless, and as such should also be treated. Also, circular economy deals with discarded waste that is a resource and renewable energy source. This would regulate the issue of the environment, job creation, through the implementation of new and modern technologies, which should reduce the unemployment rate.

Key words : *Circular economy, recycling, advanced technologies.*

SAŽETAK:
Strategija Europa 2020 je jedan od načina na koje EU, preko javne politike, pokušava da implementira zakone formalnih i neformalnih institucija. Riječ je o implementiranju cirkularne ekonomije na tlo zemalja koje su spremne za ove vrste reformi. Cirkularna ekonomija bi imala zadatak da se bavi već postojećim otpadom, tako što će selekcijom i reciklažom istog da izdvoji one komponente koje su upotrebljive i neupotrebljive, te kao takve treba i da budu tretirane. Takođe, cirkularna ekonomija se bavi odbačenim otpadom koji predstavlja resurs i obnovljivi izvor energije. Na ovaj način bi se regulisalo pitanje okoliša, otvaranje novih radnih mjesta, kroz implementaciju novih i savremenih tehnologija, što bi trebalo da smanji stopu nezaposlenosti.

Ključne riječi : *Cirkularna ekonomija, recikliranje, napredne tehnologije.*

EKOLOGICAL TYPE OF HYDROPOWER PLANT

EKOLOŠKI TIP HIDROELEKTRANE

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ABSTRACT;

The ecological type of hydropower plant is such hydropower facility that can be built in the protected areas without the construction of dams and without creating artificial hydro accumulations. This type of hydro power plant provides a high level of preservation of natural ecosystems that existed before its construction.

The ecological type of hydropower plant produces electricity during the middle and high water levels. During low water level hydropower plant stops working at that moment when the flow drops to evaluated ecological water flow. [1]Present economic, sporting, cultural and other social activities in the watercourse, especially traditional ones which have historical, cultural, landscape and other values for the local community can remain unchanged as before its construction. The ecological type of hydropower plant is an original approach to the construction of the hydropower facility in the area that is rich in water and where this type of renewable energy source can be used in an optimal way. Together with the other types of construction of hydropower plants and other types of renewable energy sources (wind, solar, biomass energy, etc.), the ecological types of hydropower plants may enable Bosnia and Herzegovina to achieve set goals and to produce 40% of the renewable energy by the 2020.[2]

Keyword: *hydropower plant, ecological type, renewable energy sources,*

SAŽETAK :

Ekološki tip hidroelektrane je takvo hidroenergetsko postrojenje koje se može graditi i u zaštićenim područjima, bez gradnje brana i bez stvaranja umjetnih hidroakumulacija. Ovaj tip hidroelektrane obezbjedjuje visok stepen očuvanja prirodnog ekosistema koji je postojao i prije njene izgradnje.Ekološki tip hidroelektrane proizvodi električnu energiju za vrijeme srednjeg i visokog nivoa voda. U vrijeme niskog vodostaja hidroelektrana prestaje sa radom onog momenta kada proticaj opadne na proračunati ekološki protok vode.[1]Dosadašnje privredne, sportske, kulturne i sve druge društvene aktivnosti na vodotoku, posebno one tradicionalne, koje imaju historijsko-kulturološke,pejsažne i druge vrijednosti za lokalnu zajednicu mogu ostati nepromijenjene kao i prije njene gradnje. Ekološki tip hidroelektrana je originalan pristup gradnji hidroenergetskog objekta na području koje je bogato vodom i gdje je ovu vrstu obnovljivog izvora energije moguće koristiti na optimalan način.Zajedno sa drugim tipovima gradnje hidroelektrana kao i drugim vrstama obnovljivih izvora energije (vjetar, solarna energija, energija biomase i sl.), ekološki tipovi hidroelektrana mogu Bosni i Hercegovini omogućiti ispunjavanje zacrtanih ciljeva da se do 2020. godine proizvodi 40% energije iz obnovljivih izvora.[2]

Ključne riječi: *hidroelektrana , ekološki tip , obnovljivi izvori energije .*

LIPIDNA BIOGORIVA KAO OBEĆAVAJUĆA GORIVA

LIPID BIOFUELS AS PROMISING FUEL

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ABSTRACT:
The promising biofuels which are used today and which will be used in the future are lipid biofuels (pure plant oil and biodiesel). Biofuels already established in fuel markets, such as pure plant oil and biodiesel are denoted as first generation biofuels. They are usually produced from food crops. Rape seed, sunflower, soybean and palm oil are examples of feedstocks for biodiesel and pure plant oil production. The use of lipid biofuels is closely linked to available and future engine technologies.
The production and use of biodiesel and pure plant oil is already well established and a further promotion of these fuels mainly depends on non-technical issues, such as policies and cost-effectiveness. The main disadvantage of first generation biofuels is that only a specific range of crops can be used for the biofuel production.

Keywords: *lipid biofuels, biodiesel, pure plant oil*

SAŽETAK:
Biogoriva koja se danas koriste i koja će se u vremenu koje dolazi koristiti sa velikim očekivanjem su tzv. lipidna biogoriva (čisto biljno ulje i biodizel). Biogoriva su već zastupljena u prometu goriva, pri čemu čisto biljno ulje i biodizel se označavaju prvom generacijom biogoriva. Oni se uglavnom dobijaju iz kultura koje se koriste u ishrani. Uljana repica, suncokret, soja i palmino ulje su sirovine koje se koriste za dobijanje biljnog ulja i biodizela. Korišćenje lipidnih biogoriva je blisko povezano sa raspoloživih i budućim tehnologijama vezanim za rad motora. Proizvodnja i korišćenje biodizela i biljnog ulja već je prisutno a veća potrošnja i dobijanje ovih goriva u budućnosti ne zavisi od tehničkih rešenja već od politike i cene. Glavni nedostatak biogoriva prve generacije je da se samo specifične kulture mogu koristiti za njegovu proizvodnju.

Ključne reči*: lipidna biogoriva, biodizel, čisto biljno ulje*

DECIMATION FOR SIGMA DELTA A/D CONVERTERS BASED ON COMB FILTERS

DECIMATION ZA PRETVARACE ANALOGIKO/DIGITAL SIGMA DELTA SA CESLJASTIM FILTERIMA

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ABSTRACT:
Sigma Delta Analog to Digital Converter (SD A/D) is the most popular converter to transform the analog signal into its digital form. It consists of two principal parts: modulator and decimation. In modulator the analog signal is sampled at the rate which is higher that Nyquist rate and the noise is shaped. As a result, it is obtained an increased resolution and an increased Signal-to-Noise Ratio (SNR). The rate of the oversampled signal must be decreased to Nyquist rate in the digital part. This process introduces aliasing which must be eliminated by the decimation filter. Due its simplicity, the most popular decimation filter is comb filter. However its magnitude characteristic exhibits a high passband droop which may deteriorate the decimated signal. Additionally, it does not provide sufficient attenuations in the so called folding bands (bands around the zeros of the comb). In this paper we will present the method to improve comb magnitude characteristic and the corresponding implementation in Field Programmable Gate Array (FPGA).
Keywords: *SD A/D, modulador, decimator, zero rotation, nonrecursive form, recursive form.*

SAŽETAK:
Sigma Delta pretvaraci analognih signala u digitalne signale (SD A/D) su u danasnje vrijeme najpopularniji Analogno/ Digitalni pretvaraci. SD A/D se sastoji od dva glavna dijela: analogni dio ili modulador i digitalni dio ili decimador. U analognom dijelu se sampluje analogni signal sa frekvencijom samplovanja koja je znatno veca od minimalne, definisane kao Nyquist frekfencija i osim toga se oblikuje sum. Kao rezultat toga se dobiva znatno bolja rezolucija i povecani odnos Signal/ Sum (SNR odnos).U digitalnom dijelu se trebaju eliminisati nepotrebni samplovi ili smanjiti brzinu samplovanja do Nyquistove brzine. Medjutim , taj proces uvodi nezeljeni efekat koji se zove aliasing i koji se mora eliminisati sa digitalnim filterom da bi se ocuvao signal.Taj filter se zove decimalni filter. Cesljasti filter (comb filter) je medju najpopularnijim decimalnim filterima zbog svoje izrazite jednostavnosti. Medjutim on ima i nedostatke kao na primjer njegova magnituda u domenu niskih frekvfencija ima pad ,tj nije konstantna, sto bi moglo da deformise signal. Pored toga njegova magnituda nema potrebno prigusenje u frekvencijama oko nula cesljastog filtera, gdje se treba eliminisati aliasing. Mnoge metode su bile predlozene za rjesavanje navedenih problema cesljastih filtera. U ovome radu cemo predstaviti neke od tih metoda i konacno predstavit FPGA implementaciju izabranog filtera.
***Ključne riječi*:** *SD A / D, modulator, decimator, nulta rotacija, nerekurzivne forme, rekurzivne forme*

TECHNIQUES TO IMPROVE SIMULTENEOUSLY PASSBAND AND STOPBAND OF COMB DECIMATION FILTERS

METODE ZA ISTOVREMENO POBOLJŠANJE PROPUSNOG I NEPROPUSNOG OPSEGA CESLJASTIH DECIMACIONIH FILTERA

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ABSTRACT:
Decimation is the process of decreasing the sampling rate in the digital form. This process introduces aliasing which must be eliminated by the decimation filter. Comb filter is the most popular decimation filter, usually used in the first stage of decimation. This filter must have flat characteristic in the passband to prevent the distortion of the decimated signal. Additionally it must have high attenuation in the so called folding bands (bands around the comb zeros). Different methods have been proposed to improve the comb magnitude characteristic in the passband, in the folding bands, and in both: passand and folding bands, preserving its simplicity. In this paper we will review the most popular techniques to simultaneously improve the magnitude characteristic of the comb decimation filter in both: the passband and stopband. MATLAB simulations are used to compare the resulting magnitude characteristics.

Keywords: *decimation, comb, passband droop, aliasing, folding bands.*

SAŽETAK:
Smanjenje brzine samplovanja u digitalnom obliku se naziva decimacija. Proces decimacije unosi nezeljeni efekat koji se naziva aliasing i koji se mora eliminisati sa digitalnim filtrom. Cesljasti decimacion filter je zbog svoje jednostavnosti najcesce koristeni decimacioni filter i to obicno na prvoj etapi decimacije. Da bi se izbjegla deformacija signala, ovaj filter mora imati ravnu karakteristiku u propusnom opsegu. Osim toga, da bi se eliminisao aliasing, filter mora imati jako slabljenje u opsezima oko nula cesljastog filtera, koji se nazivaju folding bands. Buduci da cesljasti filter ne zadovoljava pomenute karakteristike, razne metode su bile predlozene da poprave karakteristuku cesljastog filtera u propusnom, ili nepropusnom opsegu , ili u oba opsega, sa namjerom ocuvanja jednostavnosti ovoga filtera. U ovome radu ce se predstaviti najpopularnije metode za istovremeno poboljsanje magnitude u propusnom i nepropusnom opsegu. Simulacije u MATLAB-u omogucavaju poredjenje dobivenih rezultata.

***Ključne riječi*:** *decimacija, češalj, smanjenje propusnosti, aliasing, folding bands.*

WEB-BASED INFORMATION SYSTEM FOR OPTIMAL SUPPLIER SELECTION

WEB BAZIRANI INFORMACIONI SISTEMI ZA OPTIMALAN ODABIR DOBAVLJAČA

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ABSTRACT:
This paper presents a developed web-based information system that helps a user to choose the best alternative (solution) regarding a multi-criteria decision problem. The system sorts (ranks) alternatives into several groups, from the best to the worst group. All alternatives within each group are equivalent. According to a user's experiences and the circumstances, his/her task is just to choose the most favourable alternative within the best group. This system is universal and thus allows the solving of a wide-range of decision problems. Operation of the system from the user's perspective is illustrated using a case study for evaluating suppliers with respect to price, quality, and delivery time of the product, as well as of the reputation and remoteness of suppliers. Then, on the basis of the evaluation, the best supplier is selected from amongst the various alternatives. The main part of the system is a module for non-dominated sorting based on Pareto optimality and written in the Lisp programming language for sorting (ranking) alternatives in the preferred order. The remaining modules are written in the Java programming language and communicate with the main part through the files of types LSP and XML, respectively. Web support is implemented using modern technologies including EJB, JSF, PrimeFaces, jQuery, JavaScript, AJAX, XHTML, and CSS3.

Keywords: *decision support systems, supplier selection, web technologies, Pareto optimality*

CONCLUSION

We have successfully developed a web-based information system to assist the user regarding a multi-criteria decision making problem for optimal supplier selection. In the developed system, we would like to highlight the following features: easy scalability due to its modular design, high efficiency of the algorithm for non-dominated sorting, various display modes of the sorted results, and dynamic adaptation of the website to the width of the browser window or the type of the user's device.
The usefulness of the system has been tested on a real multi-criteria problem of choosing the best supplier, which is a problem that businesses and other organisations are regularly faced with.
The existing system is limited to addressing the problem of decision making using a finite number of explicitly given alternatives. It would be possible to upgrade it to deal with discrete problems, where a set of alternatives would be described by constraints in the form of mathematical functions, and the system would search for optimal solutions by optimisation.

PLC CONTROL SYSTEM DESIGN FOR VEHICLE TIRE MOLDS PREHEATING

PLC UPRAVLJAČKI SISTEM ZA PREDGRIJAVANJE KALUPA ZA IZRADU GUMA

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ABSTRACT:
This paper is dealing with the reconstruction of the control of preheating mold machine. Old system with relay devices for operation control is replaced by new electronic PLC one. There are designed and created a new electronic signal grid with fieldbus and new control system using programmable logic controllers (PLCs) as well as human-machine interface (HMI). They are used for control and setting parameters of preheating technology. New algorithms and programs for PLC and HMI have been created, and reparation of mechanical parts of the preheating machine has been performed. Device is after all make changes used for saving time in manufacture.

Keywords: *programmable logic controller, control system, tire molds, preheating*

CONCLUSION

Device works after reconstruction properly and saves the time. In the future, PLC controllers with HMI can be connected to management system of production of tires. The controllers connected by LAN bus are to be send data of errors and critical states. To evaluate the efficiency of pressing machine could be used the information regarding to the time of the mold preheating which brings mentioned time saving.

ACKNOWLEDGEMENT

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WEB APPLICATION ELOCATION

WEB APLIKACIJA ELOKACIJA

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ABSTRACT:

Web application eLokacija (eLocation) has purpose to get the location of the mobile users on the computer. It consists of two parts: mobile and static. The mobile user sends the his present location data using GPS and Internet connection from new generation smatphone, which some static users with computers with Internet connection can review. Before using the application it is obligatiory to register both users, the static as well as mobile. As application uses new Internet technologies for it's usage is necessary to have newer version of a Web browser: IE 9, Firefox 5.5, and newer.

Keywords: *web application, mobile user, static user, eLocation*

SAŽETAK:

Web aplikacija eLokacija je namjenjena za dobivanje lokacija mobilnih korisnika na računaru. Ona se sastoji iz dva dijela: mobilnog i statičkog. Mobilni korisnik sa GPS i Internet konekcijom sa smatphone-a novije generacije šalje podatke svoje trenutne lokacije koje određeni statički korisnici za računarom sa Internet konekcijom mogu pregledati. Za korištenje aplikacije je obavezno registrovanje i statičkog i mobilnog korisnika. Kako aplikacija koristi novije Internet tehnologije za njeno korištenje je potrebna i novija verzija browser-a: IE 9, Firefox 5.5, i novije.

Ključne riječi: *web aplikacija, mobilni korisnik, statički korisnik, eLokacija*

CRYPTOGRAPHY CHALLENGES FOR CYBER SECURITY MODEL OVER CLOUDS

KRIPTOGRAFSKI IZAZOVI ZA SAJBER SIGURNOSNI MODEL NAD CLOUD-OM

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ABSTRACT:
The term 'cloud computing' is popular and suddenly everywhere, representing one of the fastest growing segments of the IT industry. Despite of all the hype surrounding the cloud, security is still one of the major issues which reduces the growth of cloud computing and causes all complications with data privacy and data protection in cloud market. Recent research are focused on bringing semantics in security models aimed on addressing the problems of management and monitoring of services shared by different parties (with different semantics and interests) and further use of intelligent reasoning techniques to maximize usability, efficiency and legal foundations. On the other side, proper encryption is needed before uploading deposited data to the cloud. In this paper, we make comprehensive analyses of existing cryptographic techniques and encryption schemes from the perspective of embedding basic security parameters in semantically enhanced security model, thus representing security assessments over data storage in cloud.

Keywords: *clripthography, cloud computing, security model*

SAŽETAK:
Izraz 'cloud computing' je vrlo popularan i predstavlja jedan od najbrže rastućih segmenata u IT industriji. Uprkos velikoj zainteresovanosti za cloud, sigurnost je i dalje jedan od glavnih problema koji usporava rast cloud-a i izaziva sve komplikacije vezane za privatnost i zaštitu podataka na cloud tržištu.Nedavna istraživanja su usmerena na uvođene semantike u bezbednosne modele u cilju rešavanja problema upravljanja i monitoringa servisa deljenih od različitih strana (sa različitim semantikama i interesima) i daljeg korišćenja inteligentnih tehnika rasuđivanja za maksimizaciju efikasnosti, upotrebljivosti, kao i pravnih osnova. S druge strane, pre deponovanja podataka na cloud-u je neophodna pravilna enkripcija. U ovom radu se daje sveobuhvatna analiza postojećih kriptografskih tehnika i enkripcionih šema za potrebe ugrađivanja osnovnih bezbedonosnih parametara u semantički poboljšane bezbedonosne modele nad cloud sistemima, čime se dobijaju bezbednosne procene skladištenja podataka u cloud-u.

Ključne reči: *kroptografija, cloud computing, sigurnosni model*

AUDIO SIGNAL PROCESSING APPLYING THE PROGRAMMING LANGUAGE MATLAB

OBRADA ZVUČNIH SIGNALA PRIMJENOM PROGRAMSKOG JEZIKA MATLAB

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ABSTRACT

In the real world there are many physical definition audio, while in the digital world is just a "bunch" of numbers arranged in some matrix write down. Of course, with each matrix write down can be controlled and so with this. Very good solution for the processing of matrix write down the programming language MATLAB. It allows input, mixing, selection, change any element of the matrix and all mathematical operations applied to the matrix. For audio signal processing in MATLAB used is "audio and video support," which consists of files for: read and write audio signals; files for recording and playback of audio signals. Application of aforementioned "audio and video support-a" and tools for processing matrix, in this paper, is described audio processing: from entry, mixing and selection of audio signals, audio signals filtering based on frequency, the production of "pure tone", a graphic representation and audio reproduction.

Keywords: *Audio, MATLAB, Reproduction, Recording, Filter*

SAŽETAK:

U stvarnom svijetu postoji mnogo fizičkih definicija zvuka, dok u digitalnom svijetu je samo to "hrpa" brojeva raspoređenih u nekim matričnim zapisima. Naravno, sa svakim matričnim zapisom se može upravljati pa tako i sa ovim. Veoma dobro rješenje za obradu matričnih zapisa je programski jezik MATLAB. On omogućava unos, spajanje, razdvajanje, promjenu bilo kog elementa matrice i sve matematičke operacije primijenjene na matrice. Za obradu zvučnih signala u MATLAB-u koristi se „audio and video support" koji se sastoji od fajlova za: učitavanje i zapisivanje zvučnih signala; fajlova za snimanje i reprodukciju zvučnih signala. Primjenom navedenog „audio and video support-a" i alata za obradu matrica, u ovom radu, je opisana obrada zvuka od unosa, miksanja i razdvajanja zvučnih signala, filtriranja zvučnih signala na osnovu frekvencije, prizvodnje „čistih tonova",grafičkog predstavljanja i reprodukcije zvuka.

Ključne riječi: *Zvuk, MATLAB, reprodukcija, snimanje, filter.*

MIKROKONTROLER PIC16F877A I NJEGOVA UPOTREBA ZA UPRAVLJANJE ISTOSMJERNIM MOTOROM

MICROCONTROLLER PIC16F877A AND ITS USE FOR DC MOTOR CONTROL

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ABSTRACT: *In this work is described DC motor control using two microcontrollers PIC16F877A. In this system MATLA @SIMULINK and Real-Time Toolbox, who is used for work in real time, sent control signals over the serial port to the microcontroller PIC16F877A. Microcontroller PIC16F877A processes the received information and controls the work of the module for pulse-width modulation (PWM). The amplified signals from the PWM module are use to control the speed and direction of a DC motor. Speed measurement is done using an optical encoder. Received signals from the optical encoder microcontroller PIC16F877A processes and sends them over the serial port in computer. Received information about the actual speed (position) of the DC motor MATLAB@SIMULINK compares with the desired speed (position). If there is a difference, it is processed, and in a suitable form sent to the microcontroller PIC16F877A.*

Keywords: *MATAB@SIMULINK, Real-time toolbox, DC motor, optical encoder, mikrocontroller.*

SAŽETAK:
U ovom radu je opisano upravljanje istosmjernim motorom upotrebom dva mikrokontrolera PIC16F877A. U ovom sistemu MATLAB@SIMULINK i Real-Time Toolbox, koji se upotrebljava za rad u stvarnom vremenu, šalju upravljačke signale preko serijskog porta prema mikrokontroleru PIC16F877A. Mikrokontroler PIC16F877A obrađuje primljene informacije i upravlja radom modula za širinsko-impulsnu modulaciju(PWM). Pojačani signali iz PWM modula se koriste za regulaciju brzine i smjera istosmjernog motora. Mjerenje brzine se obavlja pomoću optičkog enkodera. Primljene signale iz optičkog enkodera mikrokontroler PIC16F877A obrađuje i šalje ih preko serijskog porta u računar. Primljene informacije o stvarnoj brzini (poziciji) istosmjernog motora MATLAB@SIMULINK poredi sa željenom brzinom (pozicijom). Ako postoji razlika, ona se obrađuje, i u pogodnom obliku šalje prema mikrokontroleru PIC16F877A.

Ključne riječi: *MATAB@SIMULINK, Real-time toolbox, istosmjerni motor, optički enkoder, mikrokontroler PIC16F877A.*

ASSESSMENT OF STUDENTS' PERFORMANCE BASED ON S-AHP ALGORTIHM AND HISTORICAL DATA

PROCJENA USPJEHA STUDENATA NA OSNOVU AHP ALGORITMA I ISTORIJSKIH PODATAKA

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ABSTRACT:
The ability to predict students' results within selected courses has an important quality assurance in providing learning support and academic career counselling services. Prior research has identified several models for making predictions of students' performance based on data residing in institutional information systems. Developed models do not include sources that may contain non-identifiable data (e.g. student evaluations of teaching and courses, historical data from learning management systems showing prior students' learning paths, etc.). In this paper, we propose an innovative approach for extracting students' preferences and making predictions of student course performance based on the well-known Analytic Hierarchy Process (AHP).

Keywords: *AHP algorithm,students' performance, historical data, PLE*

SAŽETAK:
Mogućnost da se predvide rezultati studenta na nekom kursu ima veliki značaj za unapređenje sistema podrške učenju. Prethodnim istraživanjima je identifikovano nekoliko modela za predviđanje uspjeha studenta na osnovu podataka koji se nalaze u informacionim sistemima univerziteta i fakulteta. Međutim, razvijeni modeli ne uključuju širok spektar resursa sa podacima poput studentskih anketa ili istorijskih podataka iz sistema za učenje koji prikazuju detaljne rezultate studenta na prethodnim kursevima. U ovom radu se predlaže novi pristup za procjenu performansi studenta i predviđanje uspjeha studenta na kursu koristeći dobro poznati AHP algoritam. (Analytic Hierarchy Process)

Ključne riječi:*AHP algoritam, uspjeh studenta, istorijski podaci, PLE*

APPLICATION OF NATURAL ZEOLITES IN AGRICULTURE

PRIMJENA PRIRODNIH ZEOLITA U POLJOPRIVREDI

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ABSTRACT:
Zeolites are silicate minerals incurred by mixing of volcanic minerals of lava with seawater. They are also known as "minerals of the future" and could be used in the agriculture, medicine, ecology, fisheries, etc. The highest quality natural is zeolite clinoptiolit with crystalline molecular structure and it is applied in agriculture. Presenting of the use of zeolite clinoptiolite in contemporary agricultural production in order to increase soil fertility, to increase the growth of the yield of agricultural plants used as animal feed, to increase the production of silage and also to pervent mycotoxins, is the main objective of this study.

Keywords: *natural zeolites, agriculture, soil, yield of plants, farm animals*

SAŽETAK:
Zeoliti su silikatni minerali nastali mješanjem vulkanskih minerala iz lave sa morskom vodom.Poznati su kao "minerali budućnosti" koji se upotrebljavaju u poljoprivredi, medicini, ekologiji, ribarstvu itd.U poljoprivredi se primjenjuje najkvalitetnija podvrsta prirodnog zeolita pod nazivom klinoptiolit sa kristalnom molekularnom strukturom.Cilj rada je prikazati primjenu zeolita klinoptiolita u savremenoj poljoprivrednoj proizvodnji za povećanje plodnosti zemljišta, povećanju prinosa poljoprivrednih biljaka, u ishrani domaćih životinja, proizvodnji silaže i prevenciji mikotoksina.

Ključne riječi:*prirodni zeoliti, poljoprivreda, zemljište, prinos biljaka, domaće životinje*

EXPERIENCES IN THE DEVELOPMENT, IMPLEMENTATION AND PROTECTION OF BIOINSECTICIDES PRODUCTION PROCEEDINGS

ISKUSTVA U RAZVOJU, PRIMENI I ZAŠTITI POSTUPKA PROIZVODNJE BIOINSEKTICIDA

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ABSTRACT: *This paper describes authors experiences in the development, application and patenting of technology process for bioinsecticides production based on Bacillus thuringiesis strains. Also it reveals ecological benefits of their use and describes key points of technological innovation in production of this biopreparates. Authors gained experiences in protection and patent registration of technology process based on microorganisms, natural strains, may be found useful to other researchers in this specific area.*

Keywords: *bioinsecticide, Bacillus thuringiensis, production*

SAŽETAK:
U ovom radu se iznose iskustva u razvoju, primeni i zaštiti postupka proizvodnje bioinsekticida na bazi sojeva Bacillus thuringiensis. Rad takođe, ukazuje na ekološki značaj njihove primene i saopštava suštinu sopstvenog, inovativnog tehnološkog postupka proizvodnje ovih preparata. Stečena iskustva posebno u zaštiti, patentiranju tehnološkog postupka koji se zasniva na primeni mikroorganizma, prirodnog soja, mogu biti korisna i drugim istraživačima u ovoj oblasti.

Ključne riječi: *bioinsekticid, Bacillus thuringiensis, proizvodnja*

SINGLE AND MULTIPLE CRITERIA MATHEMATICAL MODELS IN PROJECT MANAGEMENT FROM COST PERSPECTIVE

JEDNOKRITERIJALNI I VIŠEKRITERIJALNI MATEMATIČKI MODELI UPRAVLJANJA PROJEKTOM SA STANOVIŠTA TROŠKOVA

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ABSTRACT:
The paper defines mathematical models for minimisation of limited-resources project duration (i.e. project with limited work resources, limited material resources and limited financial resources) and minimisation of the resources in time for the given project duration. The appropriate algorithms have been developed in order to determine the optimum project plan with single criterion and with multiple criteria, using the standard PM software and familiar methodology for single-criterion optimisation and multiple-criteria programming. It is highly important to emphasise new algorithm for Material resource levelling and new algorithm for Financial resource levelling.

Keywords: *single-criterion models, multiple-criteria models, project duration minimisation, maximum costs minimisation, multiple criteria optimisation*

SAŽETAK:
U radu su definisani matematički modeli minimizacije trajanja projekta sa ograničenim resursima (tipa Work, tipa Material i finansijska sredstva) i minimizacija navedenih vrsta resursa u vremenu za dato trajanje projekta.Razvijeni su odgovarajući algoritmi za određivanje optimalnog plana projekta sa jednim kriterijem i projekta sa više kriterija, korišćenjem standardnog softvera za PM i poznatih metoda za jednokriterijalnu optimizaciju i višekriterijalno programiranje. Od posebnog značaja su novi algoritam za nivelisanje resursa tipa Materijal i novi algoritam za nivelisanje novčanih srestava.

Ključne riječi: *jednokriterijalni modeli, višekriterijalni modeli, minimizacija trajanja projekta, minimizacija maksimalnih troškova, višekriterijalna optimizacija*

UNDERSTANDING OF ECONOMIC GROWTH AND ITS SOURCES

RAZUMIJEVANJE EKONOMSKOG RASTA I NJEGOVIH IZVORA

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ABSTRACT:
The paper defines the terms of economic growth and its sources. The goal of the highest rank of any society is advancing, and what is impossible without knowledge. Understanding the sources of economic growth, their coherence and consistency are the basis for economic growth and thus increase the standard of living. Many problems of economic growth, and there are numerous ways for their way of solving. The main goal is to creating a suitable model achieve steady economic growth. Unfortunately, Bosnia and Herzegovina, burdened with numerous problems in defining the basic economic policies and the construction of an adequate economic system leaks actually search for solutions and the realization of a suitable model for growth.

Keywords: *economic growth, sources of economic growth, models of economic growth.*

SAŽETAK:
U radu su definisani pojmovi ekonomskog rasta i njegovih izvora. Cilj najvišeg ranga svakog društva jeste napredovanje, a ono je nemoguće bez znanja. Razumijevanje izvora ekonomskog rasta, njihove povezanosti i usklađenosti osnova su za ekonomski rast i na taj način povećanje standarda stanovnika. Brojni su problemi ekonomskog rasta, a brojni su i načini njihovih rješevanja. Osnovni cilj je da se stvaranjem prikladnog modela ostvari stabilan ekonomski rast. Na žalost Bosna i Hercegovina, opterećena brojnim problemima pri definisanju osnovnih ekonomskih politika i gradnje adekvatnog ekonomskog sistema, propušta zapravo traženje rješenja i ostvarivanje prikladnog modela rasta.

Ključne riječi: *ekonomski rast, izvori ekonomskog rasta, modeli ekonomskog rasta*

OPTIMIZATION OF THE SYNTHESIS OF DITHIOCARBAMIN-ACETIC ACID

OPTIMIZACIJA REAKCIJE SINTEZE DITIOKARBAMIN-SIRĆETNIH KISELINA

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ABSTRACT: *In this paper, the optimized method for dithiocarbamin-acetic acid synthesis is presented. Starting from alkylamine, carbon disulfide and sodium monochloracetate, synthesis is carried out in two successive steps. The reaction of an amine with carbon disulfide is followed by addition of sodium hydroxide in the first step. Reaction is continued in the second step with the addition of sodium monochloroacetate, isolation of alkyl-dithiocarbaminacetate sodium salt, and after reaction with hydrochloric acid, alkyl dithiocarbaminacetic acid is obtained. In order to get highest reaction yield and purity of obtained product, optimization of presented procedures was performed with respect to variable reaction parameters: reaction time, temperature and molar ratio of reactants. The structure of the synthesized compounds was confirmed by GC, ^{1}H and ^{13}C NMR, FTIR and MS instrumental methods. The mild reaction conditions and use of water as a solvent make developed synthesis of dithiocarbamin-acetic acid environmentally benign.*

Keywords: *dithiocarbamin-acetic acid, monochloracetate, alkylamine.*

SAŽETAK: *U radu je predstavljen optimizovan postupak sinteze ditiokarbamin-sirćetnih kiselina. Polazi se od alkilamina, ugljen-disulfida i natrijum-monohloracetata, sinteza se odigrava u dva uzastopna stupnja. Reakcija amina sa ugljen-disulfidom i natrijum-hidroksidom predstavlja prvi stupanj reakcije. U drugom stupnju reakcije se dodaje natrijum-monohloracetat, a na dobijenu natrijumovu so alki-ditiokarbaminsirćetne kiseline, zatim reaguje hlorovodoničnom kiselinom i dobija ditiokarbamin-sirćetna kiselina. Ostvareni su visoki reakcioni prinosi i čistoća dobijenih proizvoda ispitivanjem parametara sinteze: vreme reakcije, temperatura, molski odnos reaktanata i stepen konverzije. Struktura sintetisanih jedinjenja je potvrđena savremenim instrumentalnim metodama: GC, ^{1}H i ^{13}C NMR, FTIR i MS. Blagi reakcioni uslovi i upotreba vode kao rastvarača čine razvijeni postupak sinteze ditiokarbamin-sirćetnih kiselina ekološki prihvatljivim.*

Ključne reči*: ditiokarbamin-sirćetna kiselina, monohloracetat, alkilamin*

DEFINING THE OPTIMAL CONDITIONS FOR ZINC DITHIONATE SYNTHESIS BY REDUCTION OF SULPHUROUS ACID WITH ZINK POWDER

DEFINISANJE OPTIMALNIH USLOVA SINTEZE CINKDITIONITA REDUKCIJOM SUMPORASTE KISELINE SA CINK PRAHOM

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ABSTRACT:
Based on experimental researches of synthesis zinc dithionite, by reduction of sulphurous acid with zinc powder, optimal conditions of synthesis were determined, in a function of temperature, quality of zinc powder, with a constant speed of mixer and a constant flow of water for cooling the reaction mass. Test results show that the optimal temperature of keeping the reaction is 40◦C, the ratio of zinc powder: water is 4: 1 and a total reaction time is 65 minutes, with standard quality of zinc powder.

Keywords: *zinc dithionate, synthesis, sulphurous acid, optimal conditions.*

SAŽETAK:
Na osnovu eksperimentalnih istraživanja sinteze cinkditionita redukcijom sumporaste kiseline sa cink prahom utvrđeni su optimalni uslovi sinteze u ovisnosti od temperarure, kvaliteta cink praha uz konstantan broj okretaja mješalice i konstantan protok vode za hlađenje reakcione mase. Rezultati ispitivanja pokazuju da je optimalna temperatura vođenja reakcije 40^0C, omjer cink prah : voda 4:1 i ukupno vrijeme reakcije 65 minuta uz standardni kvalitet cink praha.

Ključne riječi: *cinkditionit, sinteza, sumporasta kiselina, optimalni uslovi.*

EVALUATION OF CHEMICAL AND SENSORY CHARACTERISTICS OF BOLETUS MUSCHROOMS FROM NATIONAL PARK UNA

PROCJENA KEMIJSKIH I SENZORSKIH KARAKTERISTIKA VRGANJA SA PROSTORA NACIONALNOG PARKA UNA

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ABSTRACT:
From the nutritional point, mushrooms characterized by the proportion of dietary fiber, minerals, aromatic compounds, vitamins and lots of valuable proteins. Recently they received a greater significance because of its antioxidative capacity correlated with the content of total phenolics, anthocyanins, organic acids and vitamin C. This work is focused on the study of nutrients in the mushroom Boletus edulis (Boletus), in its fresh and dry form, collected from the area of the National park Una and Medeno fields (Medeno polje), on its physical and sensory characteristics, as well as determining the content of compounds with antioxidant properties.
Given the physical and sensory properties of Boletus from the area of NP Una, is rated as very good, with noticeable good external appearance and weight. Chemical composition, balanced in both samples has the same or similar characteristics as described in the literature, for fresh and dried sample. Considering the content of antioxidant compounds, the samples from both areas are recognized by its high proportion of total phenolics (74,34mgGAE/100g), vitamin C (46,91mg/100g), and the extremely high content of anthocyanins (1,41mg/100g).
Keywords: *antioxidants, chemical composition, Boletus mushroom*

SAŽETAK:
Sa nutritivnog aspekta gljive su karakteristične po udjelu dijetalnih vlakana, minerala, aromatskih spojeva, vitamina, te punovrijednih proteina. U zadnje vrijeme dobile su veći značaj zbog svojih antioksidatvnih kapaciteta povezanih sa sadržajem ukupnih fenola, antocijana, organskih kiselina i vitamina C. Ovaj rad fokusirao se na istraživanje nutrijenata u gljivi Boletus edulis (vrganj), u svježem i sušenom stanju, prikupljenog sa područja Nacionalnog parka Una i Medenog polja, na fizikalne i senzorske karakteristike, kao i utvrđivanje sadržaja spojeva sa antioksidativnim svojstvima.
Obzirom na fizikalna i senzorska svojstva vrganj sa područja NP Una ocijenjen je kao vrlo dobar, sa primjetnim dobrim vanjskim izgledom i masom. Kemijski sastav, ujednačen u oba uzorka ima iste ili slične karakteristike opisane u literaturi i za svježi i sušeni uzorak. Obzirom na sadržaj antioksidativnih spojeva, uzorci sa oba područja ističu se visokim udjelom ukupnih fenola (74,34mgGAE/100g), vitamina C (46,91mg/100g), kao i iznimno visokim sadržajem antocijana (1,41mg/100g).
Ključne riječi: *antioksidativne komponente, kemijski sastav, vrganj*

EDUCATION AS A GOAL AND FACTOR OF THE STATE DEVELOPMENT

OBRAZOVANJE KAO CILJ I FAKTOR RAZVOJA ZEMLJE

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ABSTRACT:
High-quality educationin every country should represent the basic factor and goal of development. In this Paper we have considered the connection between good education and economic and social progress of the country. High-quality education implies the necessity of investment, expenses, a good concept, consistent application and control of application of certain standards. In this piece of work the quality of education has been considered by comparison of the current circumstances in poorer and richer countries/states. The last part of the work has been dedicated to the education problems in our country. We have tried to give answers such as how to make education better and how to become a factor of economic and social development of Bosnia and Herzegovina.

Keywords: *education, development/progress, investment, expenses, quality, discount, cost-benefit analysis, cost-effectiveness analysis.*

SAŽETAK:
Kvalitetno obrazovanje u svakoj zemlji treba da predstavlja ključni faktor razvoja i cilj razvoja. U ovom Radu razmatrana je povezanost između kvalitetnog obrazovanja i privrednog i društvenog razvitka zemlje. Kvalitetno obrazovanje podrazumijeva neophodnost ulaganja, odnosno troškove, dobar koncept, konzistentnu primjenu i kontrolu primjene definisanih standarda. Kvaliteta obrazovanja u ovom Radu razmatrana je poređenjem sadašnjeg stanja u manje razvijenim i više razvijenim zemljama. Posljednji dio rada posvećen je problematici obrazovanja u BiH. U Radu smo pokušali dati odgovor na pitanje kako obrazovanje učiniti kvalitetnim i faktorom privrednog i ukupnog društvenog razvoja zemlje BiH.
Ključne riječi: *obrazovanje, razvoj, ulaganja, troškovi, kvalitet, diskontovanje, cost-benefit analiza, cost-effectiveness analiza*

CONTRIBUTION PROGRAMMED LEARNING INCREASING PRODUCTIVITY OF THE ADOPTION OF KNOWLEDGE

DOPRINOS PROGRAMIRANOG UČENJA POVEĆANJU PRODUKTIVNOSTI PROCESA USVAJANJA ZNANJA

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ABSTRACT:*Programmed learning exist as an authentic form of learning a very long time, yet in the past educational process in our country so far is largely absent its mass application. Textbooks are generally not designed on the model of programmed learning, and the big question is how do teachers, especially those near the end of service, trained in the preparation and presentation of this kind of teaching. On the other hand, the development of information technology (IT) opens up completely new possibilities for mass application of programmed learning and use of the potential of the same curricular and extracurricular activities, although it is unknown to the general public of their effectiveness. In this paper, besides the theoretical framework of programmed learning and the possibilities for its greater implementation of the educational process, are presented and the results of empirical research on the effects of using the same. For the purposes of this research were created two independent base issues in the form of flash quiz conceived on the model of programmed learning, which included questions and answers to the same. At the end of the measured effect of using this approach in the acquisition of knowledge and it was found that the use of programmed learning in the offered form in both cases at the level of statistical significance increases the percentage of knowledge in the subjects. In addition, the results also suggest that students like to use the new capabilities are supported with modern technologies.*
Keywords: *programmed instruction, information technology, flash quiz, knowledge*

SAŽETAK *Programirano učenje postoji kao autentičan oblik učenja jako dugo vremena, pa ipak u dosadašnjem nastavnom procesu na našem podneblju do sada je uglavnom izostajala njegova masovnija primjena. Udžbenici uglavnom nisu koncipirani po modelu programiranog učenja, a i veliko je pitanje koliko su uopće nastavnici, pogotovo oni pri kraju radnog staža, osposobljeni za pripremu i izvođenje takve vrste nastave. Sa druge strane, razvoj informacijskih tehnologija (IT) otvara potpuno nove mogućnosti masovne primjene programiranog učenja i iskorištavanja mogućnosti istog u nastavi i vannastavnim aktivnostima, mada je široj javnosti nepoznata njihova učinkovitost.U ovom radu, osim teorijskog okvira o programiranom učenju i mogućnosti njegove masovnije primjene u edukacijskim procesima, predstavljeni su i rezultati empirijskog istraživanja o efektima korištenja istog. Za potrebe istraživanja kreirane su dvije nezavisne baze pitanja u formi flash-kviza koncipiranog na modelu programiranog učenja, a koji je sadržavao pitanja i odgovore na ista. Na kraju je izmjeren efekat korištenja tog pristupa u usvajanju znanja i utvrđeno je da se korištenjem programiranog učenja u ponuđenoj formi u oba slučaja na nivou statističke značajnosti povećava procenat usvojenosti znanja kod ispitanika. Osim toga, rezultati upućuju i na to da učenici rado koriste nove mogućnosti podržane savremenim tehnologijama.*
Ključne riječi: *programirano učenje, informacijske tehnologije, flash-kviz, znanje*

OLAP IN THE JUDICIARY

OLAP U PRAVOSUĐU

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ABSTRACT:
This paper presents the possibility of applying the tools for online analytical processing - OLAP tools in the judiciary. From the standpoint of information, processes of the judiciary generate large volumes of diverse data and the IT professionals in the justice system face a big challenge: how to efficiently and cost-effectively manage large volumes of data. A possible solution is the use of OLAP tools that through a variety of OLAP reports provide a simple and user-friendly display of relevant information from the database. The data presented in this paper are not real because of the sensitivity of the topic, while the structure was built on the basis of the report of the Prosecutor, concrete suggestions from employees and the prosecution of the criminal code of the Federation of Bosnia and Herzegovina.

Keywords: *OLAP, Data Cube, Judiciary, Business Intelligence*

SAŽETAK:
U radu je prikazana mogućnost primjene alata za izravnu analitičku obradu - OLAP alata (engl. Online Analytical Processing) u pravosuđu. Sa stajališta informacija, procesi funkcioniranja pravosuđa generiraju velike količine raznovrsnih podataka te se pred IT stručnjake u pravosuđu stavlja veliki izazov: kako efikasno i ekonomično upravljati velikim količinama podataka. Moguće rješenje je primjena OLAP alata koji kroz raznovrsna OLAP izvješća daju jednostavan i za korisnika razumljiv prikaz bitnih informacija iz baze podataka. Podaci prezentirani u radu nisu stvarni zbog osjetljivosti tematike, dok je struktura rađena na temelju izgleda izvješća Tužiteljstva, konkretnih sugestija djelatnika iz tužiteljstva te krivičnog zakona Federacije BIH.

Ključne riječi: *OLAP, podatkovna kocka, pravosuđe, poslovna inteligencija*

E-COMMERCE IN APPAREL INDUSTRY: WITH SPECIAL REFERENCE TO THE DEVELOPING COUNTRIES

E-KOMERC U ODJEVNOJ INDUSTRIJI: SA SPECIJALNIM OSVRTOM NA ZEMLJE U RAZVOJU

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ABSTRACT:
The gap between what we can imagine and what we can achieve has never been smaller. There will be nothing in the 10 year window except e-companies. That does not mean that Brick-and-Mortar (physical stores) will go away, but Click-and-Mortar (virtual stores) will become the only means of survival across many of the product categories.
E-commerce or Electronic commerce refers to trade that actually takes place over electronic channel, i.e. internet, usually through a buyer visiting a seller's website and making transaction there with the help of a payment gateway. The seller then delivers the product or service within the mentioned period of time to the buyer. This transaction can involve tangibles (physical goods such as a book or apparel) as well as intangibles (services such as a airway ticket or a software). Thus e-commerce can be defined as the buying and selling of goods and services on the internet or the World Wide Web.

Keywords: *e-commerce, world wide web, stores, apparel*

CONCLUSION

We can conclude that e-commerce has opened up enormous opportunities for businesses to expand and explore. It has encouraged budding entrepreneurs to get started. It has made our lives convenient in numerous ways. It has made shopping a hassle free experience with minimum efforts. The rise and growth of e-commerce, and especially e-retailing has created a Win-Win situation for the manufacturers, retailers as well as consumers. However, it has resulted in the closure of many businesses which served as intermediaries between the manufacturers and the retailers. It has also succeeded in bringing the entire world to one platform and one marketplace. The list is indeed endless. E-retailing has travelled a long way from where it originated. The technology is constantly evolving, and as a result, e-retailing is getting much more refined and the online shopping experience is getting enhanced day by day. It has also made way for retailers to opt for multiple channels to offer their products and services (Multi-Channel Retailing). At this point of time, it can be inferred that e-retailing has shown mixed response and its success has varied among the various product categories and service types. It has proved to be extremely successful across several product categories such as books, software, and downloadable stuff such as music and videos. It also has shown great success in the service industry such as travel tickets, banking and insurances, to name a few. However, there is still a long road to travel for e-retailing and e-retailers.

THE INFLUENCE OF FASHION STYLES TO CHANGE THE MALE-CUT JACKET

UTJECAJ MODNIH STILOVA NA PROMJENE KROJA MUŠKOG SAKOA

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ABSTRACT:

This paper introduces the development of male suits accompanied by historical overview. Suitability of the changes resulting from the development of fashion styles and their impact on the development of tailored men's jackets. It is therefore fundamental to the pattern shown basic differences of selected models with prominent elements of that time period.

Keywords: *Man suit, construction male jacket, modeling clothes*

SAŽETAK:

U ovom radu predstavljen je razvoj muškog odijela popraćen povijesnim pregledom. Istražene su promjene nastale slijedom razvoja modnih stilova te njihov utjecaj na izradu kroja muškog sakoa. Stoga je na njegovu temeljnom kroju prikazana osnovna razlika izabranih modela s istaknutim elementima tog vremenskog razdoblja.

***Ključne riječi*:** *Muško odijelo, konstrukcija muškog sakoa, modeliranje odjeće*

INNOVATIONS IN 3-D CLOTHES DESIGN

INOVACIJE U 3-D DIZAJNU ODJEĆE

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ABSTRACT:
In modern life the apparel production in European countries will be competitive only if it takes minimum time and guarantees innovative unique quality to products. The new technologies in 3-D clothes design, which are developed in Moscow state university of design and technology, allow quickly create patterns for new fashions, estimate quality of fitting and foresee features of textile materials structure deformation. The task of our research is to organize all processes of clothes design in 3-D. Special attention we pay to noncontact measurement and united process of texture structure design and clothes form creation.

Keywords: *three-dimensional scanning, 3D model, fitting quality assessment, virtual design, virtual fitting.*

CONCLUSION
Due to introduction of new technologies the virtual three-dimensional design will successfully replace the classical planar design method and in future will exclude full-scale prototype working out, which will significantly increase production efficiency and reduce consumption, increase the frequency of fashions replacement.
The developed system allows to present virtual images of the designed items on any virtual individual or typical figures which is demanded by the consumer or industrial customer. The system is an objective tool for virtual assess of designed item fitting quality on the human body and contributes the virtual fitting on realistic 3D models of consumers bodies.
This software application will provide an introduction of the mass customization concept, interaction with customers to increase sales and strengthen relationships with a circle of customers due to accumulation of information about them and their purchases for subsequent analysis and formation of manufacturing plan and sales strategy.

ABOUT FASHION IN CHILDREN FOOTWEAR

O MODI U DJEČIJOJ OBUĆI

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ABSTRACT:
During a long time "children's fashion" did not exist. Sociologists and philosophers explain this situation by the fact that in previous century due to high mortality the society did not pay enough attention to appearance and even the lives of children. Only in the age of Enlightenment attitudes towards children began to change. Design of children's clothes and footwear is a very complicated field. Despite globalization and harmonization of existing international experience, children's fashion still has its own characteristics. Today children are included in the social process and share the lifestyle of the parents, their clothes and shoes have changed.

Keywords: *footwear, fashion, range.*

CONCLUSION

In modern conditions increase of competitiveness of the enterprises is connected with successful forecasting of a set of characteristics of footwear, both in the field of art modeling and ergonomic designing.

SOCIETY FOR ROBOTICS OF BOSNIA AND HERZEGOVINA

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

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DRUŠTVO ZA ROBOTIKU U BOSNI I HERCEGOVINI

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

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