



**University of Kragujevac
Faculty of Technical Sciences Čačak**



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Technics and Informatics in Education**

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PREFACE

Seventh international scientific conference *Technics and Informatics in Education – TIE 2018* aims to promote and support research in education of new generations in technical and technological fields at all levels of education and contribute to technology development and education improvement.

Some 72 papers have been submitted within various fields of technical, IT and technology-supported education at all educational levels – primary, secondary, higher education and education for adults. After reviewing, 64 papers have been accepted for the current edition of Book of abstracts in the form of plenary lectures and original scientific papers.

Articles in the *Book of Abstracts TIE 2018* are organized by the following topics:

- Plenary lectures
- Technics, Technology and Informatics in Education
- IT Education and Practice
- Engineering Education and Practice

Special activities within the Conference are the following:

- Round Table – University education of the professors of technics and IT in the region
- The Day of Computing – 20 years of Computer engineering studies at the Faculty of technical sciences Čačak
- Poster Session: Research project in the field of technical sciences and teaching at the Faculty of technical sciences

The Scientific and Organizing Committee wishes to express gratitude to all the professionals from various fields who contributed to the Conference.

We would like to thank Partner Institutions which participated as co-organizers of the Conference.

We express special thanks to the Ministry of Education, Science and Technological Development of the Republic of Serbia for financial support to this scientific gathering.

Ivan Milićević
Editor

CHAIRMEN'S FOREWORD

Faculty of Technical Sciences Čačak, University of Kragujevac, has the honour to organize the seventh international scientific conference 'Technics and Informatics in Education – TIE 2018'.

The Conference continues the tradition of gathering scientific associates and professionals in technical, technological and IT education in primary and secondary schools in Serbia. For the last 50 years this assembly has been organized in various forms (scientific and professional conferences and consultations on technical education, information technologies, technical seminars, etc.). These scientific and professional gatherings have had a huge impact on the development of technical education, mostly in primary and secondary education. The impact is also noticeable in both higher and university education. Six conferences titled Technics and Informatics in Education were held in 2006, 2008, 2010, 2012, 2014 and 2016. Still, the necessity for continuous, organized scientific assembly related to technics and informatics in new surroundings has increased.

The aim of the conference TIE 2018 is to improve the exchange of knowledge and experience between experts, scientific associates and professionals from Serbia, neighbouring countries and Europe, engaged in the subject matter. The conference will provide an analytical review of technical (technological) and IT education, as well as education regarding technical (technological) and IT achievements including assistive technology, teaching aids, student books, etc. Teacher training is considered highly significant for research and development in education in this field.

The Conference includes technical (technological) education at all levels: from preschool institutions, primary and secondary schools over higher and university education, to various forms of lifelong learning.

Furthermore, the special emphasis will be given to the place, importance, and role of informatics and IT in technical and professional education, as well as correlation with other natural, social and education science.

A comprehensive analytical review will be given on the state of education in the fields of technics and informatics, as well as the contribution of technical and IT education to other fields.

The conference results are expected to provide the basis for planning the development of education in Serbia, especially in the fields of technical (technological) education, engineering, IT and informatics. The results are also expected to support and contribute to the exchange of educational patterns in the region and coordination with European trends in this field.

We hope that experience gained at the Conference will be very useful both for the participants and for the development of technical-technological education field.

*Danijela Milošević
Željko M. Papić
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Organization

The 7th International Scientific Conference Technics and Informatics in Education – TIE 2018 is organized by the Faculty of Technical Sciences Čačak, University of Kragujevac, Serbia.

The Conference is held under the patronage of:

- Ministry of Education, Science and Technological Development of Republic of Serbia
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PLENARY SESSION: Keynotes

P1	<i>D. Purković</i> Conceptualization of Technology as a Curriculum Framework of Technology Education	3
P2	<i>I. Luković</i> Formal Education in Data Science – A Perspective of Serbia	4
P3	<i>D. Pavlović Babić</i> New approaches in designing educational assessment instruments and its use in international (assessment) studies: What's new in PISA 2018?	5

SESSION I: Technics, Technology and Informatics in Education

1.1.	<i>D. Draganić, M. Stefanović, M. Mijakovac, Lj. Stanisavljević, J. Stanisavljević</i> Application of interactive whiteboard in the consideration of concepts pollination and pollinators	9
1.2.	<i>V. Ilić, T. Stojanović-Đorđević, A. Šiki-Erski</i> ICT and Art Education	10
1.3.	<i>D. Politis, D. Margounakis, R. Tzimas, G. Kazdaridis, N. Paris, V. Aleksić</i> Learning to Sing Byzantine Music Online: The Intersection of Rich Content Education and Special Education	11
1.4.	<i>B. Đorić, D. Lambić, Ž. Jovanović</i> Educational software for learning psychics - combination of simulations and formative assessment	12
1.5.	<i>D. Kreculj, G. Jovišić, G. Manojlović, S. Minić</i> Programming and Simulation of Model Controls in Teaching Technics and Informatics	13
1.6.	<i>B. Arsović, L. Zlatić</i> Video Games - Influence on Children's Cognitive Abilities	14
1.7.	<i>S. Gavrilović, P. Pravdić, G. Miodragović</i> Video Conference in Terms of Application of ICT in Education	15
1.8.	<i>N. Diković</i> Application of a remote experiment in elementary school teaching	16
1.9.	<i>S. Obradović, G. Moumou, D. Moumou, H. Sidiropoulou, A. Sidiropoulou</i> Enhancing Teaching and Learning in Greece by Implementation of ICT in Educational System	17

1.10.	V. Žigić, Z. Savković, D. Maćešić-Petrović, M. Veselinović The contribution of information technology in the education of high school students with visual impairment	18
1.11.	S. Puzović, V. Paunović, J. Vesić Vasović Implementation of the Lean concept within Smart School Management	19
1.12.	D. Pokrajac, V. Mladenović Predictive Analytics for Students' Success	20
1.13.	Lj. Pečić Future Belongs to Innovative and ICT Skilled Nations – Is Serbia Ready?	21
1.14.	V. Petrović, G. Popović Božanić Professional orientation of secondary school students of economics	22
1.15.	S. Milovanović, N. Kićanović, K. Dunjić Mandić, B. Đorić Grammar School Graduates' Professional Decision-Making and Higher Education Orientation	23
1.16.	S. Mijailović, V. Lazarević, M. Đukić Application of statistics for the analysis of results achieved in primary education	24
1.17.	L. Palurović, L. Tica Language of the Internet – change or decline?	25

SESSION II: IT Education and Practice

2.1.	N. Stefanović, M. Janjić Cloud Services in Higher Education	29
2.2.	S. Bauk, T. Dlabac Shifting Education to Cloud: A Reference to Maritime Studies	30
2.3.	D. Knežević The Correlation Between International E-Learning Standards and National Standards of Serbia and Nearby Countries	31
2.4.	M. Bursać Comparative Analysis of E-Learning Standard	32
2.5.	Ž. Micić, V. Ružičić Knowledge Sources in ICS Fields With Daily Intensity of Innovation – „TIE”-2017	33
2.6.	J. Atanasijević Comparative Analysis of the Development and Application of Standards for Software Development in Serbia and BiH	34

2.7.	P. Stolić, D. Milošević Using Web Server Log Files for Analysis and Improvements Related to Study Programs	35
2.8.	M. Milošević, M. Radović, O. Ristić Will You Bring Your Laptop? Investigating Students' Attitudes Towards BYOD	36
2.9.	Đ. Damjanović, K. Mitrović Usability Testing in Human-Computer Interaction Classroom	37
2.10.	V. Veljović The concept of development of the intelligent tutoring system sensitive to emotions	38
2.11.	M. Bojović Online Reading Strategies Use in English as a Foreign Language in Biotechnical Engineering	39
2.12.	S. Nogo, D. Vasiljević Mechanism for Migrating Data in Relational Databases	40
2.13.	N. Marković, D. Živković, F. Marković Information system for obtaining reports on students of the High Technical School of Vocational Studies from Urosevac in Leposavic	41
2.14.	A. Pešić Knowledge Bases in the Field of Expert Systems and Artificial Intelligence	42
2.15.	Đ. Đurković, M. Milošević An Analysis of User's Information Security Awareness	43
2.16.	S. Nogo, Z. Škrkar Benchmark of Web Browsers with Automated Testing Tool	44
2.17.	S. Šošić, O. Ristić, K. Mitrović, D. Milošević Software Testing Course in IT Undergraduate Education in Serbia	45
2.18.	Lj. Kazi, D. Radosav, Z. Kazi, E. Cherkashin, M. Bhatt, A. Kansara Teaching Adaptability and Code Reuse of Web Applications with the N-tier Architecture: Case study in VS.NET	46
2.19.	V. Paunović, S. Puzović, J. Vesić Vasović One MCDM Approach to Learning Management Systems Evaluation	47
2.20.	S. Đokić, S. Stanojlović, D. Vujičić Possibility of Deploying COSMOS Operating System on Personal Computers	48
2.21.	M. Radojčić, I. Obradović, R. Stanković, M. Utvić, S. Kaplar A Mathematical Learning Environment Based on Serbian Language Resources	49

SESSION III: Engineering Education and Practice
--

3.1.	M. Stanisavljević, M. Stojković Financial Literacy of Engineering Students - Waiting for PISA 2018 Results in Serbia	53
3.2.	H. Hochrinner, J. Haas Dual/Cooperative Education in Higher Education	54
3.3.	N. Dučić, J. Baralić, R. Slavković Innovation of University Courses in The Field of Manufacturing Technologies Based on The Implementation of Dual Education	55
3.4.	D. Pršić, V. Stojanović, V. Đorđević A Constructive Approach to Teaching with Robotino®	56
3.5.	V. Jevremović, Z. Petrović, V. Ćirić, M. Popadić Application of the RobotStudio software package for programming assembly robots	57
3.6.	S. Aleksandrov, S. Vulović Creating an Android Weather Forecast Application in the Android Studio	58
3.7.	Đ. Damnjanović, M. Milošević, D. Vujičić, Ž. Jovanović, D. Jagodić Simulations of Analog Circuits in Multisim Software Suite	59
3.8.	D. Politis, A. Nikiforos, V. Aleksić Differences in Radio Broadcasting between Europe and America: two Separate Models and the Advent of the Digital Audio Broadcasting System	60
3.9.	D. Mitrović, S. Randić Arduino Platform Capabilities in Multitasking Environment	61
3.10.	D. Mitrović, D. Marković, S. Randić Raspberry Pi module clustering and cluster application capabilities	62
3.11.	G. Nađ, A. Glišić, M. Radak, I. Nađ, J. Živanić Multifunctional Solar Park with “+five in one”	63
3.12.	S. Štatkić, N. Arsić, Ž. Milkić, A. Čukarić Photovoltaic Laboratory Trainer in Student Educations for Renewable Energy Sources	64
3.13.	R. Surla, N. Mitrović, J. Oreļj, V. Joksimović The Magnetoimpence Effect Principles of Measuring	65
3.14.	M. Luković, A. Kalezić-Glišović, B. Nedeljković, S. Antić A tomographic method for determining the distance between standing wave anti- nodes and the frequency of electromagnetic radiation inside a microwave oven	66

3.15.	M. Luković, B. Koprivica, A. Milovanović Educational Laboratory Setup for Electric Current Measurement using Hall Effect Current Sensors	67
3.16.	S. Milosavljević, A. Milovanović, B. Koprivica Virtual Instrumentation for Load Cell – Calibration and Measurements	68
3.17.	M. Rosić, M. Bjekić, M. Šučurović Application of Induction Machine U/f Control Through the Educational Laboratory Setup	69
3.18.	V. Vujičić, I. Milićević, S. Dragičević, M. Marjanović Realization of Model of Robotic Arm S-430iF for Education Purposes	70
3.19.	M. Marjanović, S. Dragičević, I. Milićević, M. Popović, V. Vujičić Application of Computer Simulation in Engineering Education	71
3.20.	A. Mitrović, M. Radović Design of 3D Virtual Classroom in Second Life for Metal Cutting Technology Course	72
3.21.	I. Terzić, S. Aleksandrov, M. Todorović Numerical Analysis of The Profile in the Aero Tunnel	73
3.22.	A. Pešić, V. Lazarević, M. Đukić Health Care Analysis Using Statistics	74
3.23.	M. Papić, M. Blagojević, H. Hochrinner, V. Kraguljac Student Attitudes about Cheating in High Education	75



**7th International Scientific Conference
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PLENARY SESSION KEYNOTES

Notes:

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Conceptualization of Technology as a Curriculum Framework of Technology Education

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Abstract: Technical (technological) and engineering knowledge is characterized by constant variability and unpredictable dynamics of development. Therefore, the system of technological knowledge can't be compared to the content base of most other subjects or areas. While the knowledge of other areas is relatively stable, technological knowledge is subject to constant upgrading and alignment with the dynamics of technology development. Due to the tremendous growth and pervasiveness of knowledge, the technology and engineering is faced with the problem of appropriate systematization, while the technology education faces the problem of conceptualizing, selecting and elaborating such knowledge for learning and teaching purposes. In this light, experts and teachers face the problem of conceptualizing technical knowledge in order to achieve the desired learning goals in a very limited time. Thus the openness of the curriculum is becoming more a serious alternative to the today's content-limited curriculum. Therefore, this paper presents an overview of selected concepts of technological knowledge as an attempt to facilitate the future development of the technology education curriculum. In this connection, conceptualization of technology is proposed, as a unique model that takes into account different ways of conceptualizing technology in an individual's mind. Such conceptualization can become a universal framework for the development of the curriculum of technology education.

Keywords: conceptualization of technology, curriculum framework, technical education, technology education, technology and engineering education.

Konceptualizacija tehnologije kao okvir nastavnog plana i programa u tehničkom obrazovanju

Rezime: Osnovne karakteristike tehničkog (tehnoškog) znanja jesu njegova konstantna podložnost promeni i nemogućnost predviđanja dinamike njegovog daljeg razvoja. Iz tog razloga je nemoguće porediti tehničko znanje sa većinom drugih predmeta ili oblasti saznanja. Dok je poznavanje drugih oblasti relativno stabilno, ovo znanje zahteva neprestano usavršavanje i usklađivanje sa dinamikom razvoja tehnologije. Konstantan porast obima znanja doveo je do problema sa kojim se danas suočavaju tehnologija i inženjerstvo, a koji se odnosi na prikladnu sistemizaciju tog znanja. Tehničko obrazovanje je takođe suočeno sa problemom konceptualizacije, odabira i elaboriranja postojećeg znanja. U tom smislu, stručnjaci i nastavnici se susreću sa problemom konceptualizacije tehničkog znanja kako bi se postigli željeni ciljevi učenja u veoma ograničenom vremenskom roku. Otuda otvorenost nastavnog plana i programa postaje sve ozbiljnija alternativa današnjem nastavnom planu koji podrazumeva ograničenost sadržaja. Ovaj rad stoga predstavlja pregled odabranih koncepata znanja iz oblasti tehnologije kako bi se olakšao budući razvoj nastavnog plana u tehnološkom obrazovanju. S tim u vezi, konceptualizacija tehnologije se predlaže kao jedinstven model koji uzima u obzir različite načine na koje ljudi poimaju tehnologiju. Takva konceptualizacija bi mogla postati univerzalni okvir za razvoj nastavnog plana i programa u tehničkom obrazovanju.

Ključne reči: konceptualizacija tehnologije, nastavni plan i program, tehničko obrazovanje, tehnološko obrazovanje, tehnologija i inženjersko obrazovanje.

Formal Education in Data Science – A Perspective of Serbia

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Abstract: In recent years, Data Science has become an emerging education and research discipline all over the world. Software industry shows an increasing and even quite intensive interest for academic education in this area. The similar trend has been noticed in Serbia, particularly in Belgrade and Novi Sad. In this paper, we discuss main motivation factors for creating a new study program in Data Science at Faculty of Technical Sciences of University of Novi Sad. Also, we present a short survey of software industry needs for data science related experts, and discuss how we structured the new study program and addressed the main issues that come from more than evident industry requirements. The program was accredited in year 2015, both at the level of bachelor and master level studies, and this school year is its first execution, from which we expect the new experiences.

Keywords: Academic Education; Computing and Informatics; Data Science; Data Analytics; Information Engineering; Big Data Management.

Formalno obrazovanje u oblasti nauke o podacima – perspektiva Srbije

Rezime: Poslednjih godina, nauka o podacima postaje sve više prepoznata disciplina u obrazovanju i nauci, svuda u svetu. Sličan trend prisutan je u Srbiji, posebno u Beogradu i Novom Sadu. U ovom radu, biće prezentovani motivacioni faktori za kreiranje novog studijskog programa u oblasti nauke o podacima, na Fakultetu tehničkih nauka Univerziteta u Novom Sadu. Takođe, biće prezentovani rezultati manjeg istraživanja potreba softverske industrije za naukom o podacima i stručnjacima iz ove oblasti, i diskutovano kako je novi studijski program strukturiran i kako je odgovoreno na glavne izazove koji su posledica više nego jasnih zahteva industrije. Studijski program akreditovan je 2015. godine, i na nivou osnovnih i master studija, i u ovoj školskoj godini započela je njegova prva realizacija, od koje se očekuju nova iskustva.

Ključne reči: Akademsko obrazovanje; Računarstvo i informatika; Nauka o podacima; Analitika podataka; Informacioni inženjering; Upravljanje velikim skupovima podataka.

New approaches in designing educational assessment instruments and its use in international studies: What's new in PISA 2018?

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Abstract: The intention of this paper is to present the content and structure of the international assessment of student achievements OECD/Programme for International Student Assessment) and, in particular, innovative solutions in the testing techniques, competencies chosen to be assessed and contextual variables. All testing material is in the computer-based format which opens up new possibilities in assessing cognitive processes that are needed to solve tasks. Besides regularly assessed reading, mathematics and scientific literacy, new testing domains are financial literacy and global competence. A part of test material (in the domain of reading literacy is based on multistage adaptive testing design, which increase the informative value of achievement data. Among number of contextual factors, students are asked to perceive their well-being exploring. Looking for students' feelings related to usual, everyday situations and activities, it is possible to conclude what they need to live happy and fulfilling life. Finally, the use of log file in order to define students' problem-solving strategies is discussed.

Keywords: assessment; education; adaptive testing; literacy; student achievement.

Novi pristupi u dizajniranju instrumenata za procenu obrazovnih postignuća i njihova primena u internacionalnim studijama: Šta novo donosi PISA 2018?

Rezime: Namera ovog rada je da prikaže sadržaj i strukturu OECD/PISA (Programme for International Student Assessment) međunarodne studije procene učeničkih postignuća, a prevashodno nova i inovativna rešenja u pogledu tehnika testiranja, izbora novih kompetencija i kontekstualnih varijabli koje se procenjuju. U ovom ciklusu kompletan testovni materijal je pripremljen u elektronskom formatu što otvara nove mogućnosti za procenu angažovanih kognitivnih procesa. Pored čitalačke, matematičke i naučne pismenosti, u kojima se postignuća redovno procenjuju, testiraju se i novi domeni – finansijska pismenost i opšta kompetencija. Deo testovnog materijala (u oblasti čitalačke pismenosti) prilagođen je višefaznom adaptivnom test dizajnu koji povećava informativnu vrednost podataka o postignućima učenika. Među brojnim kontekstualnim varijablama, jednim brojem pitanja od učenika se traži i da procene sopstvenu dobrobit. Istraživanje osećanja koja učenici vezuju za uobičajene, svakodnevne situacije i aktivnosti omogućava da se izvedu zaključci o tome šta je učenicima potrebno da bi njihovi životi bili srećni i ispunjeni. U radu se diskutuju i mogućnosti korišćenja log fajlova za utvrđivanje strategija koje učenici koriste kada rešavaju problemske zadatke.

Ključne reči: procena; obrazovanje; adaptivno testiranje; pismenost; učenička postignuća.



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SESSION I

**TECHNICS, TECHNOLOGY AND
INFORMATICS IN EDUCATION**

Notes:

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Application of Interactive Whiteboard in The Consideration of Concepts Pollination and Pollinators

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Abstract: Teaching biology is characterized by a great number of concepts and facts. Particularly, it is very important that students understand the role of insects (especially insect pollinators) and their importance in nature. In order to effectively present important concepts such as pollination and pollinators, interactive white board (IWB) can be used. In this paper, an analysis of the efficiency of application of an IWB in the biology teaching was presented in terms of attained knowledge among students. In particular, the pedagogical experiment with parallel groups was applied to determine whether the IWB was effective as teaching technology compared to the usual teaching approach without this technology. The E group covered programme content related to pollination and pollinators by applying IWB. The C group was exposed to the same content, without IWB in teaching process. It was evidenced a difference of the attained knowledge in favor of the experimental group after the introduction of the experimental factor (application of IWB). The application of IWB directly contributed to better learning and knowledge acquisition in teaching the biology content Pollination and Pollinators. It was concluded that IWB are determined as very effective teaching technology.

Keywords: interactive whiteboard (IWB); biology teaching; insect pollinators; pollination; elementary school.

Primena interaktivne bele table u razmatranju koncepta oprašivanje i oprašivači

Rezime: Nastava biologije se karakteriše velikim brojem pojmova i činjenica. Posebno je važno da učenici razumeju ulogu insekata (naročito insekata oprašivača) i njihov značaj u prirodi. U cilju da se efikasno predstave važni pojmovi kao što su oprašivanje i oprašivači, interaktivne bele table (IBT) se mogu primeniti. U ovom radu, analiza efikasnosti primene interaktivnih belih tabli je predstavljena u smislu sticanja znanja kod učenika. Tačnije, pedagoški eksperiment sa paralelnim grupama je primenjen da bi se uporedila efikasnost primene IBT sa uobičajenim nastavnim pristupom, bez ove tehnologije. Eksperimentalna grupa učenika je realizovala nastavne sadržaje u vezi sa oprašivanjem i oprašivačima uz pomoć IBT. Kontrolna grupa učenika je iste sadržaje realizovala bez ove tehnologije u nastavnom procesu. Utvrđena je razlika u stečenom znanju u korist eksperimentalne grupe, nakon uvođenja eksperimentalnog faktora (primena interaktivne bele table). Primena interaktivne bele table direktno je doprinela boljem učenju i sticanju znanja u realizaciji bioloških programskih sadržaja Oprašivanje i oprašivači. Zaključeno je da je IBT veoma efikasna nastavna tehnologija.

Ključne reči: interaktivna bela tabla (IBT), nastava biologije, insekti oprašivači, oprašivanje, osnovna škola.

ICT and Art Education

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Abstract: Information and communication technologies have become an integral part of our lives. They have changed our social habits and changed our perception of ourselves and the world around us - affecting human behavior. Art works the same, even more, because it can provide unexpected performances of the world and thus provoke new insights. By utilizing new media resources, students can expand their creativity through digitally simulated information. Flexibility of digital data is what makes new media of vital importance for the teaching of fine arts. By using automated media tools and graphic software, students can quickly see the results of their ideas. By applying ICT, the amount of work in creating visual information is minimized, so students will have more time for creativity, collaboration, research and assessment.

Keywords: Information and communication technologies, art, art education.

IKT i nastava likovne kulture

Rezime: Informaciono-komunikacione tehnologije su postale sastavni deo naših života. One su promenile naše društvene navike i menjaju našu percepciju sebe i sveta oko nas - utiču na ljudsko ponašanje. Umetnost radi isto, čak i više, jer može da obezbedi neočekivane predstave sveta i time provocira nove uvide. Iskorišćavanjem novih medijskih resursa, učenici mogu da prošire svoju kreativnost kroz digitalno simulirane informacije. Fleksibilnost digitalnih podataka je ono što čini nove medije od vitalnog značaja za nastavu likovne kulture. Korišćenjem automatizovanih medijskih alata i grafičkog softvera, učenici mogu brzo videti rezultate svojih ideja. Primenom IKT minimizira se količina rada u stvaranju vizuelne informacije, tako da će učenicima ostati više vremena za kreativnost, saradnju, istraživanja i procene.

Ključne reči: Informaciono-komunikacione tehnologije, umetnost, nastava likovne kulture.

Learning to Sing Byzantine Music Online: The Intersection of Rich Content Education and Special Education

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Abstract: In the majority of scientific fields, as far as instruction is concerned, analysis, synthesis and resynthesis of findings and clues can be conveyed with multimedia enriched e-Learning courses. In other disciplines, however, there is peremptory request for exact appreciation, consideration and acknowledgement for accurate diagnoses from scientific data. Even further, strict accreditation is needed, setting up a blockade in the expansion of on-line teaching. Nevertheless, as interactivity increases the potential for regularly hosted, nearly private sessions over the Internet, with photorealism alongside an immense potential offered by advances in Mobile Communication and Learning, there are hopes that extremely demanding teaching, like musical mentoring, medical training or special education counseling, may become commodities offered by on-line courses, seminars and institutes. As this perspective lies within the intersection of formal and non-formal education, it provides reasonable optimism for a constructive transformation of immature forms of teaching to reliable, accredited nomenclatures of remote tête-à-tête tutoring over the Web.

Keywords: On-line Education, Multimedia Learning, Rich-content, Blended Learning, Accreditation and Skills, Educational TV.

Učenje pevanja Vizantijske muzike online: Presek obrazovanja bogatog sadržaja i specijalnog obrazovanja

Rezime: Ukoliko uzmemo u obzir instrukciju, u većini naučnih polja se analiza, sinteza i resinteza pronalazaka može preneti na multimedijom obogaćene kurseve za elektronsko učenje. Ipak, u drugim disciplinama postoji imperijalni zahtev za jasnim uvažavanjem, razmatranjem i potvrđivanjem tačnih dijagnoza na osnovu naučnih podataka. Štaviše, neophodna je stroga akreditacija i postavljanje blokade proširenju online učenja. Ipak, s obzirom na to da interaktivnost povećava potencijal za redovne praktično privatne sesije putem Interneta uz fotorealizam i ogroman potencijal koji nudi razvoj mobilnih komunikacija i učenja, postoji nada da će izuzetno zahtevna nastava poput muzičkog mentorstva, medicinske obuke ili savetovanja u specijalnom obrazovanju postati „roba“ koja se nudi u online kursevima, seminarima i institutima. Kako ova perspektiva leži na preseku formalnog i neformalnog obrazovanja, obezbeđuje razuman optimizam za konstruktivnu transformaciju nezrelih oblika nastave u pouzdane, akreditovane nomenklature učenja licem u lice udaljeno putem Interneta.

Ključne reči: Online obrazovanje, Učenje putem multimedije, Bogat sadržaj, Mešovito učenje, Akreditacija i veštine, Obrazovna televizija.

Educational software for learning psychics - combination of simulations and formative assessment

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Abstract: Based on results of literature review in the field of computer simulations, feedback and formative assessment, educative software which contains simulations and elements of formative assessment is presented in this paper. The software is created for the purpose of learning as well as for evaluating efficiency of this learning approach on learning process and students' achievement in field of psychics. The evaluation of usefulness of this software should be investigated in the future from different aspects.

Keywords: simulation; feedback; formative assessment; electrical circuit.

Obrazovni softver za učenje fizike – kombinacija simulacija i formativnog ocenjivanja

Rezime: U ovom radu prikazan je obrazovni softver baziran na rezultatima pregleda literature u oblasti računarskih simulacija, povratnih informacija i formativnog ocenjivanja. Softver je prvenstveno namenjen za učenje, ali i za evaluaciju efikasnosti upotrebe ovakvog pristupa učenju i učeničkog postignuća u oblasti fizike. Korisnost softvera bi trebala biti detaljnije ispitana sa različitih aspekata primene.

Ključne reči: simulacije; povratne informacije; formativno ocenjivanje; električna kola.

Programming and Simulation of Model Controls in Teaching Technics and Informatics

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Abstract: Functional, adaptable and available systems for model programming and control are important for the realization of teaching lessons from technical and technological subjects. For that purpose, web applications/services and simulation software for electronic circuits, microcontrollers and devices are optimal solutions. The following systems were analyzed: Micro:bit and Circuits, which are tailored to the level of elementary and high school. They are directly linked to informatics and computing, thus encouraging students to advance digital competences. Micro:bit is small programmable computer and online programming environment for encoding in two regimes: Block and Java Script, with derived examples in operating modes. Web application Circuits serves for modeling and simulation of electrical/electronic circuits and devices. It contains electronic components, sensors, relays, multimeter, protoboards, Arduino boards. For programmable components, functions are set by coding in known Arduino environment. The different models of electronic circuits and devices with LED, seven-segment display, servo motor, remote control have developed. For the listed models, specific codes were written, then simulations of the virtual models in real time have done. With this innovative teaching approaches, professional and intermediate competences by students are acquired and developed. Thereby will be satisfied the required goals and learning outcomes in teaching technics and informatics.

Keywords: programming; control; simulation; technics, informatics.

Programiranje i simulacija upravljanja modelima u nastavi tehnike i informatike

Rezime: Funkcionalni, adaptibilni i dostupni sistemi za programiranje i kontrolu modela važni su za realizaciju nastavnih jedinica iz tehničkih i tehnoloških predmeta. U tu svrhu, web aplikacije/servisi i simulacijski softver za elektronska kola, mikrokontrolere i uređaje optimalna su rešenja. Analizirani su sledeći sistemi: Micro:bit i Circuits, koji su prilagođeni nivou osnovne i srednje škole. Oni su direktno povezani sa informatikom i računarstvom, prema tome podstiču učenike da unaprede digitalne kompetencije. Micro:bit je mali programabilni računar i online programsko okruženje za kodiranje u dva režima: Block i Java Script, sa izvedenim primerima u operativnim modovima. Web aplikacija Circuits služi za modeliranje i simulaciju električnih/elektronskih kola i uređaja. Ona sadrži elektronske komponente, senzore, releje, multimetar, protoboard ploče, Arduino ploče. Za programabilne komponente, funkcije se postavljaju kodiranjem u poznatom Arduino okruženju. Razvijeni su različiti modeli elektronskih kola i uređaja sa LED, sedmo-segmentnim displejem, servo motorom, daljinskim upravljanjem. Za navedene modele, napisani su specifični kodovi, onda su urađene simulacije virtuelnih modela u realnom vremenu. Sa ovim inovativnim pristupima nastavi, stižu se i razvijaju stručne i međupredmetne kompetencije kod učenika. Na taj način biće zadovoljeni potrebni ciljevi i ishodi učenja u nastavi tehnike i informatike.

Ključne reči: programiranje; upravljanje; simulacija; tehnika; informatika.

Video Games - Influence on Children's Cognitive Abilities

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Abstract: The purposes and functions of play in children's development have been researched for well over a century by scientists of different disciplines. Like everything else, the play itself is experiencing transformations in the contemporary, digital age. Children spend more time with computers and other smart gadgets, both at home and at school. The question that arises is how the use of information and communication technologies and especially playing video games can affect and change children's lives – from educational and learning aid, to the emergence of depression and the promotion of violent behaviour. The paper reviews the conclusions of the research concerned with each of the five main types of play in which children engage; and highlighting the benefits of playing video games for the development of children and their skills. Article provides an overview of the limited research on the effects of using information and communication technologies on the cognitive and social development of children. The influence of playing video games on the development of cognitive abilities in children is analyzed in particular. In conclusion, the guidelines and tips for possible further research of the effects of playing video games on the children development are provided.

Keywords: video games; cognitive skills; ICT; play; children.

Video igre - uticaj na kognitivne sposobnosti dece

Rezime: Svrha i funkcija igre u razvoju dece je predmet istraživanja naučnika različitih disciplina, već više od veka. Kao i sve drugo, sama igra doživljava niz transformacija u savremenom, digitalnom dobu. Deca provode sve više vremena sa računarima i drugim pametnim uređajima, kako kod kuće tako i u školi. Postavlja se pitanje kako korišćenje informaciono-komunikacionih tehnologija, a posebno igranje video igara, može uticati i promeniti život dece - od pomoći prilikom učenja, do izazivanja depresije i podsticanja nasilnog ponašanja. U radu se razmatraju zaključci istraživanja, koji se odnose na prepoznatih pet vrsta igara u kojima se deca najčešće angažuju; i ističu se prednosti igranja video igara na razvoj dece i njihovih veština. Rad daje ograničeni pregled istraživanja o efektima korišćenja informaciono-komunikacionih tehnologija na kognitivni i društveni razvoj dece. Posebno je analiziran uticaj igranja video igara na razvoj kognitivnih sposobnosti kod dece. U zaključku se pružaju smernice i saveti za moguće daljnje istraživanje efekata igranja video igrice na razvoj dece.

Ključne reči: video igre; kognitivne sposobnosti; IKT; igra; deca.

Video Conference in Terms of Application of ICT in Education

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Abstract: Modern education must follow the development of information and communications technologies. It is necessary to introduce new teaching resources in the educational process as well as a new methodological approach in order to supplement and enrich the traditional manner of learning. In this paper videoconferencing is described as one of the aspects of the application of information and communications technologies in education. The technology of the videoconferencing system and the proper choice of conference tools and ways of realization are crucial for the success of a videoconference lecture.

Keywords: video conferencing, technology, methods, tools.

Video konferencija sa aspekta primene IKT u obrazovanju

Rezime: Savremeno obrazovanje mora ići u korak sa razvojem informaciono komunikacionih tehnologija. U obrazovni proces je neophodno uvesti nova nastavna sredstva i, u skladu sa time, i novi metodološki pristup kako bi se učenje na tradicionalan način dopunilo i obogatilo. U ovom radu će biti opisana video konferencijska komunikacija kao jedan od aspekata primene informaciono komunikacionih tehnologija u obrazovanju. Tehnologija video konferencijskog sistema i pravilan izbor konferencijskog alata i načina realizacije je od presudnog značaja za uspeh jednog video konferencijskog predavanja.

Ključne reči: video konferencija, tehnologija, načini realizacije, alati.

Application of a remote experiment in elementary school teaching

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Abstract: In an effort to track the rapid development of the technique and to make their teaching more interesting and adapt to ever-increasing demands, technology and technology teachers must be interconnected and in constant relation with their faculties. This paper presents an example of cooperation and sharing of knowledge and resources of faculties with pupils and teachers of elementary schools. The paper presents the class, which was held in a small village school as a visiting time and participated in the competition "Digital Time" organized by the Ministry of Trade, Tourism and Telecommunications. Different methods and forms of teaching were applied at the same time, and at one time the students actively participated in the experiment at the Faculty of Technical Sciences in Čačak.

Keywords: teaching; school; university; cooperation; resource sharing.

Primena udaljenog eksperimenta u nastavi u osnovnoj školi

Rezime: U pokušaju da prate veoma brz razvoj tehnike a ujedno i da svoju nastavu učine interesantnijom i prilagode je sve višim zahtevima, nastavnici tehnike i tehnologije moraju biti međusobno povezani i u stalnoj vezi sa svojim fakultetima. Ovaj rad predstavlja primer saradnje i deljenja znanja i resursa fakulteta sa učenicima i nastavnicima osnovnih škola. Rad predstavlja čas, koji je održan u maloj seoskoj školi kao ogledni čas i učestvovao je na konkursu „Digitalni čas“ u organizaciji Ministarstva trgovine, turizma i telekomunikacija. Na samom času primenjene su različite metode i oblici nastave a na jednom delu časa učenici su se aktivno učestvovali u eksperimentu na Fakultetu tehničkih nauka u Čačku.

Ključne reči: nastava; škola; fakultet; saradnja; deljenje resursa.

Enhancing Teaching and Learning in Greece by Implementation of ICT in Educational System

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Abstract: Nowadays, there is a general consensus about the importance of applying ICT in all areas of life, and certainly in education. In educational process ICT can be applied by teachers at all levels of education and in different educational context. There are many benefits that can be achieved in this way. In order to achieve the desired results, it is of great importance how ICT support is organized at the level of the entire educational system. Great progress in this area has been recorded in Greece in recent years. Some examples of ICT implementation in Greece educational system are presented in the paper.

Keywords: education, ICT, Greek educational system.

Unapređivanje nastave i učenja u Grčkoj primenom IKT u sistemu obrazovanja

Rezime: Danas je postignuta opšta saglasnost o važnosti primene IKT u svim oblastima života, pa i u obrazovanju. U procesu obrazovanja nastavnici primenjuju IKT na svim nivoima i u različitim pedagoškim kontekstima. Na ovaj način se mogu postići brojne dobiti. Da bi se postigli željeni rezultati, veoma je važno kako je organizovana IKT podrška na nivou čitavog obrazovnog sistema. Poslednjih godina je u Grčkoj došlo do naglog napretka u ovoj oblasti, a primeri primene su prikazani u radu.

Ključne reči: obrazovanje, IKT, sistem obrazovanja u Grčkoj.

The contribution of information technology in the education of high school students with visual impairment

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Abstract: This paper focuses on the identification of software and information technology programs in the education of high school students with visual impairment. The sample included 32 respondents, 17 females and 15 males, all categories of visual impairment. The aim of the research is to determine which software and programs the high school students with visual impairments commonly use, whether they prefer tactile or voice outputs, as well as the dependence of computer competencies of the schools they attend and their success at school. The obtained results will be discussed in the paper, and it would point out the possibilities of practical implication of the results through the use of information technologies in improving the participation of high school students with visual impairment in educational activities.

Keywords: information technology, education, student, visual impairment.

Doprinos informacione tehnologije u obrazovanju srednjoškolaca sa oštećenjem vida

Rezime: Ovaj rad se fokusira na identifikovanje softvera i programa informacione tehnologije u obrazovanju srednjoškolaca sa oštećenjem vida. Uzorak obuhvata 32 ispitanika, 17 ženskog i 15 muškog pola, svih kategorija oštećenja vida. Cilj istraživanja je da se utvrdi koje softvere i programe srednjoškolci sa oštećenjem vida najčešće koriste, da li više preferiraju taktilne ili govorne izlaze, kao i zavisnost računarskih kompetencija od škole koju pohađaju i školskog uspeha. U radu će biti diskutovani dobijeni rezultati i biće ukazano na mogućnosti praktične implikacije rezultata kroz korišćenje informacionih tehnologija u poboljšanju učešća srednjoškolaca sa oštećenjem vida u obrazovnim aktivnostima.

Ključne reči: informaciona tehnologija, obrazovanje, učenik, oštećenje vida.

Implementation of the Lean concept within Smart School Management

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Abstract: Smart school represents a new educational concept that have dramatically changed education system, not only teaching and learning processes but the management process. In order to overcome the challenges that these changes bring, school managers must to adopt and implement advanced management concepts, such as Lean concept. The implementation of the Lean concept within smart school management will ensure that all processes, required to support the teaching-learning function, are integrated into a rational entity that purposefully and effectively operates towards achieving objectives. The paper indicates the Lean principles whose implementation within smart school system management will enable improving of education processes.

Keywords: smart school concept; Lean concept; management.

Implementacija Lean koncepta u okviru menadžmenta pametnih škola

Rezime: Pamete škole predstavljaju novi obrazovni koncept koji dramatično menja sistem obrazovanja, ne samo procese nastave i učenja već i proces upravljanja. U cilju prevazilaženja izazova koje ove promene donose, menadžeri škola moraju usvojiti i implementirati napredne menadžerske koncepte, kao što je Lean koncept. Implementacija Lean koncepta u okviru menadžmentom pametnih škola će osigurati da se svi procesi, potrebni za podršku funkciji nastave i učenja, integrišu u racionalni entitet koji svrsishodno i efikasno djeluje ka postizanju ciljeva. U radu se navode i analiziraju Lean principi čija implementacija u proces upravljanja pametnim školama može omogućiti poboljšanje obrazovnih procesa.

Ključne reči: koncept pametnih škola; Lean koncept; menadžment.

Predictive Analytics for Students' Success

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Abstract: We discuss needs and necessary prerequisites to efficiently utilize predictive analytics in the educational environment. Factors, such as data availability and quality and organizational commitment are considered in the predictive analytics framework. Various tasks, both academic and financial, where the predictive analytics can find its use at the institutions of higher education are identified, as well as the technology available to accomplish the analytics process.

Keywords: Student's success; predictive analytics; statistics; databases; machine learning.

Prediktivna analitika za studentski uspeh

Rezime: U ovom radu diskutujemo o potrebama i neophodnim preduslovima za efikasno korišćenje prediktivne analitike u obrazovnom okruženju. Faktori, kao što su dostupnost podataka i kvalitet i organizacijska opredeljenja, razmatraju se u okviru prediktivne analitike. Identifikovani su različiti zadaci, kako akademski, tako i finansijski, gde se prediktivna analitika može naći u institucijama visokog obrazovanja, kao i tehnologija koja je na raspolaganju za postizanje analitičkog procesa.

Ključne reči: Studentski uspeh; prediktivna analitika; statistika; baze podataka; mašinsko učenje.

Future Belongs to Innovative and ICT Skilled Nations – Is Serbia Ready?

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Abstract: We are witnesses of intensive transformations of society where innovations are everyday business of each company striving to stay on the market. This paper aims to bring the most interesting facts about the characteristics of nowadays business, innovativeness, education in order to clear the connections between business success, innovation and ICT skills of citizens of different countries. It is obvious that growth still belongs to those countries which had the best innovation models implemented in the whole society and with strong economy support. Serbia has potentials, but should reorganize itself.

Keywords: innovations, ICT skills, economy growth.

Budućnost pripada nacijama koje su inovativne i poseduju informaciono-komunikativne veštine – da li je Srbija spremna?

Rezime: Svedoci smo intenzivne transformacije društva u kome su inovacije deo svakodnevnog posla kompanija koje žele da zadrže svoje mesto na tržištu. Ovaj rad nastoji da iznese najinteresantnije činjenice o današnjem načinu poslovanja, inovativnosti, obrazovanju u cilju pojašnjenja veze koja postoji između poslovnog uspeha, inovacija i kompjuterske pismenosti građana različitih država. Očigledno je da rast i dalje pripada onim državama koje imaju razvijene najbolje modele primene inovacija u celom društvu, sa jakom ekonomskom podrškom istima. Srbija ima potencijal, ali se mora reorganizovati.

Ključne reči: inovacije, informaciono-komunikacione veštine, ekonomski rast.

Professional orientation of secondary school students of economics

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Abstract: Professional identification and orientation is an important turning point because it reflects personal opinions on different occupations, affects personal satisfaction of the individual, self-esteem and self-respect, as well as the biological and social progress of the community. The paper presents the results of the research of the professional orientation of students of the fourth grade of the School of Economics in Čačak, conducted in 2017/2018. school year. Choosing a life course at the end of a high school is a major decision that is conditioned by various factors and this choice can be influenced by a multitude of life elements, the current state of the world and the personal attitude and desires of the individual.

Keywords: professional orientation; professional determination; professional maturity; professional development.

Profesionalna orijentacija učenika ekonomske struke

Rezime: Profesionalno opredeljenje je važna životna prekretnica jer reflektuje lična mišljenja o različitim zanimanjima, utiče na lično zadovoljstvo pojedinca, samopouzdanje i samopoštovanje, kao i na biološki i društveni napredak zajednice. U radu su prikazani rezultati istraživanja profesionalne orijentacije učenika četvrtog razreda Ekonomske škole u Čačku, sprovedenog 2017/18. školske godine. Izbor životnog puta po završetku srednje škole je velika odluka koja je uslovljena raznim faktorima i na ovakav izbor može uticati mnoštvo životnih elemenata, trenutno stanje u svetu i lični stav i želje pojedinca.

Ključne reči: profesionalna orijentacija; profesionalno opredeljenje; profesionalna zrelost; profesionalni razvoj.

Grammar school graduates' professional decision-making and higher education orientation

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Abstract: Professional orientation is a continuous lifelong process and is tasked with helping and directing young people to better understand their own aspirations and the opportunities provided. The paper presents an overview of the results from the empirical research in gymnasiums in Čačak and Gornji Milanovac, as well as a review of the motives and reasons that have the biggest influence on the professional decision of the graduates.

Keywords: professional development; professional/vocational orientation, professional maturity; factors of professional development; grammar school graduates.

Profesionalno opredeljivanje maturanata gimnazije

Rezime: Profesionalna orijentacija je kontinuiran celoživotni proces i ima zadatak da pomogne i usmeri mlade ljude da bolje uvide i sagledaju vlastite aspiracije i mogućnosti koje im se pružaju. U radu je prikazan pregled rezultata empirijskog istraživanja u gimnazijama u Čačku i Gornjem Milanovcu, kao i pregled motiva i razloga koji imaju najveći uticaj pri donošenju profesionalne odluke maturanata.

Ključne reči: profesionalni razvoj; profesionalna/stručna orijentacija; profesionalna zrelost; faktori profesionalnog razvoja; gimnazije.

Application of Statistics for the Analysis of Results Achieved in Primary Education

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Abstract: Statistics is one of the most applicable mathematical disciplines dealing with data collecting and processing as well as the analysis of the achieved results. Statistical packages enable quick processing of these data and performing statistical analyses. In this paper, the application of Statistica software package enabled processing of the data that included 80 pupils. The achievements of pupils from the subject of technical and informatics education were examined by tests. Descriptive statistical procedures were used in data processing. Appropriate statistics were used to carry out the analysis and adequate interpretations of the obtained results were provided. The test results indicate a normal distribution of data as well as gender independence relative to the area being tested by testing.

Keywords: statistics, descriptive statistics, hypothesis of testing, statistical analysis.

Primena statistike za analizu postignutih rezultata u osnovnom obrazovanju

Rezime: Statistika je jedna od najprimenljivijih matematičkih disciplina koja se bavi prikupljanjem i obradom podataka, kao i analizom dobijenih rezultata. Statistički paketi omogućavaju brzu obradu tih podataka i vršenje statističkih analiza. U ovom radu, primenom softverskog paketa Statistica, su obrađeni podaci obima 80 učenika (tri odeljenja). Testovima znanja je ispitivano postignuće učenika iz predmeta Tehničko i informatičko obrazovanje. U obradi podataka korišćene su deskriptivne statističke procedure. Za sprovođenje analize korišćene su odgovarajuće statistike i data su adekvatna tumačenja dobijenih rezultata. Rezultati testiranja ukazuju na normalnu raspodelu podataka kao i nezavisnost između polova u odnosu na oblast koja se ispituje testiranjem.

Ključne reči: statistika, deskriptivna statistika, testiranje hipoteza, statistička analiza.

Language of the Internet – change or decline?

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Abstract: Language constantly evolves and technology accelerates that change dramatically. Over the past three decades, the development of communication technologies has recorded the fastest rate in history and has made remarkable impact on the English language. This language ‘revolution’ has been met with apprehension by the community in much the same way as every new technology in history did. The objective of this paper is to present actual technology-induced language changes in the English language, especially the language of texting and instant messaging, and analyse the objectivity of increasing debate among community concerning the changes. The paper also attempts to provide predictions about possible future development of the English language in the environment of fast-pace developing communication technology.

Keywords: language; technology; texting; instant messaging; future.

Jezik interneta – odraz promena ili korak unazad ?

Rezime: Razvoj novih tehnologija ima značajan uticaj na razvoj jezika. Tokom poslednje tri decenije, razvoj komunikacionih tehnologija, naročito interneta, bio je dominantan u odnosu na bilo koji period u istoriji čovečanstva i doveo je do značajnih promena u svim segmentima jezika, a naročito engleskog, s obzirom na zastupljenost u pomenutom kontekstu. Ova jezička ‘revolucija’ naišla je na kritički pristup izvesnih akademskih krugova na sličan način na koji su tokom istorije prihvatane promene u oblasti nauke i tehnike. Cilj ovog rada je predstavljanje aktuelnih promena u engleskom jeziku koje su rezultat tehnološkog razvoja, naročito novina u jeziku kojim se služe korisnici društvenih mreža, a koje su predmet kritike pomenutih segmenata društvene zajednice, kada je reč o uticaju novih tehnologija na pravac razvoja korpusa i strukture engleskog jezika.

Ključne reči: jezik; tehnologije; tekstualne poruke; razmena trenutnih poruka.



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SESSION II

IT EDUCATION AND PRACTICE

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Cloud Services in Higher Education

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Abstract: This paper presents analysis of using Cloud Services in educational institutions in Serbia, as well as some background information on the contemporary trends in Cloud Computing and Cloud Services. Cloud Services offer great possibilities for improvement of education processes in Serbia, especially bearing in mind lack of funds to properly equip computer classrooms with computer configurations required by modern desktop software. Also, collaboration in teaching and research is much easier with using Cloud Services than traditional desktop-oriented computing.

Keywords: cloud services, higher education; collaboration; integration; e-learning.

Cloud servisi u visokom obrazovanju

Rezime: U ovom radu su opisane mogućnosti korišćenja Cloud servisa u jednoj obrazovnoj instituciji u Srbiji, a dat je kratak pregled aktuelnih trendova u oblasti "računarstva u oblaku". Cloud servisi omogućuju unapređenje procesa obrazovanja u Srbiji, posebno imajući u vidu nedostatak finansijskih sredstava za kvalitetno opremanje računarskih učionica modernom opremom i kvalitetnim softverom. Takođe, saradnja u procesima obrazovanja i istraživanja je daleko jednostavnija uz primenu Cloud servisa.

Ključne reči: cloud servisi, visoko obrazovanje, saradnja, integracija, e-učenje.

Shifting Education to Cloud: A Reference to Maritime Studies

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Abstract: The basic hypothesis posed in this paper is that in the future education and professional training will be increasingly blended into the Cloud domain. The reasons are above all of the economic nature. They are reflected in space, time, teaching and administrative staff savings, since the education is mostly treated as a cost, and less frequent as an investment. This applies more and more to the developed parts of the world, and especially to those who are conditionally in development or in transition. In support of this hypothesis in the paper we have provided some useful examples of how off- and on-line computer assisted video tutorials from sea-navigation can be used in Cloud based education and training for (future) seafarers at maritime studies departments.

Keywords: Cloud; education and training; seafarers.

Izmiještanje obrazovanja u Klauđ: Osvrt na studije pomorstva

Rezime: Osnovna hipoteza od koje se polazi u radu je da će obrazovanje i profesionalno usavršavanje sve češće biti izmiještani u domen Klauđa. Uzroci su prije svega ekonomske prirode. Reflektuju se kroz uštede u prostoru, vremenu, nastavnom i administrativnom osoblju, budući da se obrazovanje sve češće tretira kao trošak, a sve rjeđe kao investicija. Ovo važi u sve većoj mjeri za razvijene djelove svijeta, a posebno za one koje su uslovno rečeno u razvoju ili u tranziciji. U prilog ovoj hipotezi u radu je dato nekoliko korisnih primjera, u smislu kako se “off-“ i “on-line” računarski podržani video nastavni materijali iz pomorske navigacije mogu koristiti u obrazovanju i obuci, koji se oslanjaju na Klauđ, a namijenjeni su (budućim) pomorcima na studijama pomorstva.

Ključne reči: Klauđ; obrazovanje i obuka; pomorci.

The correlation between international e-learning standards and national standards of Serbia and nearby countries

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Abstract: The paper presents the status of e-learning standards published during the period from 2004 to 2017, focusing on international standards (ISO) on the one hand and national standards of Serbia and nearby countries such as Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Albania, Hungary, Romania and Slovenia on the other hand. The development trends of the national sets of standards are analyzed and compared with the development trend of international standards regarding both the number of published standards and their prices. The analysis of the data obtained using statistical methods reveals the current status of the national standards in relation to international ones, as well as their interrelationship. The data are also grouped into price ranges, and their relative and cumulative frequencies are determined. The results of the comparison indicate significant differences between the analyzed sets of standards, especially between national and international ones.

Keywords: correlation, statistical analysis, standards, e-learning.

Korelacija međunarodnih grupa standarda u oblasti e-učenja sa nacionalnim standardima Srbije i zemalja u okruženju

Rezime: U radu je prikazano stanje standarda na lokalnom i međunarodnom nivou objavljenih u periodu od 2004-2017. godine za oblast e-učenja. Predmet posmatranja su međunarodni (ISO) i lokalni standardi Srbije i zemalja u okruženju (Bosne i Hercegovine, Hrvatske, Makedonije, Bugarske, Crne Gore, Albanije, Mađarske, Rumunije i Slovenije). Prikazan je trend razvoja ovih grupa standarda i izvršeno njihovo poređenje sa međunarodnim standardima i njihovim trendom kako u pogledu broja objavljenih standarda tako i u pogledu cena. Upotrebom statističkih metoda i analizom dobijenih podataka predstavljen je trenutni položaj lokalnih u odnosu na međunarodne standarde, kao i njihov međusobni odnos. Izvršeno je i grupisanje podataka prema cenovnim razredima i određena kumulativna i relativna frekvencija. Rezultati poređenja ukazuju na znatne razlike između posmatranih grupa standarda, posebno kada se posmatra odnos lokalnih sa međunarodnim standardima.

Ključne reči: korelacija; statistička analiza; standardi; e-učenje.

Comparative Analysis of E-Learning Standard

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Abstract: In this paper is presented a comparative analysis of standards in the field of e-learning, published both by ISO and International Organization for Standardization standards, as well as standards by local organizations in the countries of the region. The aim of the research is to analyze the current situation at the global and local level in the field of e-learning. The results obtained by the survey indicate similarities and differences both in terms of publication trends and the price values of standards published by the international ISO organization and local organizations of the countries of the region.

Keywords: e-learning; standardization; trend analysis; comparative analysis.

Komparativna Analiza Standarda E-Učenja

Rezime: U radu je predstavljena komparativna analiza standarda u oblasti e-učenja, objavljenih kako od strane globalnih (ISO - International Organization for Standardization) standarda, tako i standarde od strane lokalnih organizacija zemalja regiona. Cilj istraživanja odnosi se na analizu trenutnog stanja na globalnom i lokalnim nivou u oblasti e-učenja. Rezultati dobijeni istraživanjem ukazuju na sličnosti i razlike kako po pitanju trenda objava, tako i po cenovnim vrednostima standarda objavljenih od strane međunarodne ISO organizacije i domaćih organizacija zemalja regiona.

Ključne reči: E-učenje, standardizacija, analiza trenda objava.

Knowledge sources in ICS fields with daily intensity of innovation – "TIE"-2017

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Abstract: The paper presents the multicriteria research and statistical analysis of knowledge trends in the standardized Engineering fields (technics) and Information Technology (informatics). The focus is on the innovation of the sources of knowledge (in education), at the beginning of the second decade of the XXI century until 2017 – "TIE"-2017. The goal is to provide the resources and improve the quality of knowledge, on the platform of the international I (ISO) and local (national SRPS) standardization. The paper presents the significant details (results and analysis) by comparing the trends of knowledge sources, according to the analyzed fields / subfields classified according to the International Classification for Standards (ICS) ICS1 = 35 (Information Technology - IT), where ICS1 = 01 to 99. Moreover, the paper presents the plans for further development of an access to knowledge sources in the form of standards (as obligations), as well as comparisons of the index of innovation in IT with other standardized fields, especially the fields of engineering (e.g. ICS1 = 01, 23, 25, 35, 49, 83, 91 - daily intensity of innovation or weekly intensity - ICS1 = 29, 33, 59, 75, 77, etc.).

Keywords: standardization; knowledge sources; trends of knowledge; innovation index.

Izvori znanja u oblastima ICS sa dnevnim intenzitetom inovativnosti - "TIE" -2017

Rezime: U radu je prikazano višekriterijsko istraživanje i statistička analiza trendova znanja u standardizovanim inženjerskim oblastima (tehnika) i informacionim tehnologijama (informatika). Fokus je na inoviranju izvora znanja (u obrazovanju), početkom druge decenije XXI veka do 2017. godine - "TIE" -2017. Cilj je obezbediti resurse i poboljšati kvalitet znanja, na platformi međunarodne standardizacije (ISO) i lokalne (nacionalne SRPS) standardizacije. U radu su prikazani značajni detalji (rezultati i analiza) upoređivanjem trendova izvora znanja, prema analiziranim oblastima/ podoblastima klasifikovanim prema Međunarodnoj klasifikaciji standarda (ICS) ICS1 = 35 (Informacione tehnologije - IT), gde je ICS1 = 01-99. Takođe, u radu su prikazani planovi za dalji razvoj pristupa izvorima znanja u obliku standarda (kao obaveza), kao i upoređivanje indeksa inovacija u IT sa drugim standardizovanim oblastima, posebno oblasti Inženjeringa (na primer, ICS1 = 01, 23, 25, 35, 49, 83, 91 - intenzitet dnevnog intenziteta ili nedeljni intenzitet - ICS1 = 29, 33, 59, 75, 77 itd).

Ključne reči: standardizacija, izvori znanja, trendovi znanja, indeksi inovacija.

Comparative analysis of the development and application of standards for software development in Serbia and BiH

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Abstract: The paper analyzes and crosses the state of local SRPS and standardization from the neighbouring state of Bosnia and Herzegovina BAS, in the field of information technologies. The accent is given on published standards; i.e. the standards currently in use in the field of Information Technology - ICS1 = 35; Substance Software - ICS2 = 35.080. Presented in the paper are the current standards in the field of software development as well as the organizations dealing with them, with reference to the state of local standardization in relation to the standardization of the neighbouring country. The aim of the research is to look at the status quo from several different aspects in the field of software development. The results of the research indicate the current state and the position of local standardization in relation to the neighbouring country and serve as an indicator of the necessary financial resources for software standards; and their mutual differences in number per year.

Keywords: Software; Trend; Standardization; SRPS; BAS.

Komparativna analiza razvoja i primene standarda za razvoj softvera u Srbiji i BiH

Rezime: U radu je predstavljena sistematizovana analiza i presek stanja lokalne SRPS i standardizacije iz susedne države Bosne i Hercegovine BAS, u oblasti informacionih tehnologija. Akcenat je dat na objavljenim standardima, tj. standardima koji su trenutno u upotrebi u oblasti Informacione tehnologije – ICS1 = 35, podoblast Softver– ICS2 = 35.080. U radu su predstavljeni aktuelni standardi u oblasti razvoja softvera, kao i organizacije koje se bave istim, sa osvrtom na stanje lokalne standardizacije u odnosu na standardizaciju susedne države. Cilj istraživanja je da se sagleda trenutno stanje, sa više različitih aspekata, u oblasti razvoja softvera. Rezultati istraživanja ukazuju na trenutno stanje i položaj lokalne standardizacije, u odnosu na susednu državu i služe kao pokazatelj na potrebne finansijske resurse za standarde u oblasti softvera, i njihove međusobne razlike u broju na godišnjem nivou.

Ključne reči: Softver; Trend; Standardizacija; SRPS; BAS.

Using Web Server Log Files for Analysis and Improvements Related to Study Programs

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Abstract: Almost every computer system records data about the corresponding events in the system through the so-called log data. Log data can provide meaningful information and knowledge about different aspects of system use, but placed in the appropriate context, log data also provides knowledge beyond the boundaries of the system in which they are generated. The paper shows how log data obtained from one web server can be used to analyze and improve study programs. The entire flow of log data transformation from the sources to the final results applicable for further work is shown. The paper points to a part of the potentials that log records have and how this potential can be used within the framework of higher education work. A concrete solution is presented based on the use of an appropriate infrastructure powered by Elastic Stack solution.

Keywords: Elastic Stack, higher education, log, study program, web server.

Upotreba log datoteka web servera u svrhu analize i poboljšanja studijskih programa

Rezime: Skoro svaki računarski sistem beleži podatke o odgovarajućim događajima u sistemu putem tzv. log podataka. Log podaci mogu pružiti značajne informacije i znanje o različitim aspektima korišćenja sistema, a stavljani u odgovarajući kontekst, log podaci, takođe, pružaju i znanje van granica sistema u okviru koga se generišu. U radu je prikazano kako se log podaci dobijeni sa jednog web servera mogu koristiti u svrhu analize i poboljšanja studijskih programa. Predstavljen je celi tok transformacije log podataka od njihovog nastanka do krajnjih rezultata primenljivih u daljem radu. Ovaj rad ukazuje na deo potencijala koje log podaci poseduju i kako se ovaj potencijal može koristiti u okvirima visokoškolskog obrazovanja. Predstavljeno je konkretno rešenje bazirano na korišćenju odgovarajuće infrastrukture realizovane putem Elastic Stack rešenja.

Ključne reči: Elastic Stack, visokoškolsko obrazovanje, log, studijski program, web server.

Will You Bring Your Laptop? Investigating Students' Attitudes Towards BYOD

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Abstract: The paper investigates students' attitudes towards introducing BYOD (Bring Your Own Device) in teaching of Information Technology (IT) related subjects. Many advantages in having BYOD are reported, but no general benefit can be taken for granted as there are specific circumstances in different technological and socio-economical environments. We examined group of senior students of IT study program, which heavily use computer labs for various subjects and part of them had already experienced usage of their own portable computers in class. Results indicated a great willingness of using own computers. A vast majority of students do have a portable computer and virtually no obstacle in introducing BYOD was indicated. These findings may encourage faculty management to start thinking in this novel way of facilitating the study process.

Keywords: students; learning; BYOD; teacher; education.

Da li ćeš poneti svoj laptop? Istraživanje stavova studenata prema BYOD-u

Rezime: Rad istražuje stavove studenata prema uvođenju politike donošenja sopstvenog uređaja (BYOD - Bring Your Own Device) na nastavu informatičkih predmeta. Zabeležene su brojne prednosti BYOD-a, međutim nijedna se ne može prihvatiti ad-hoc, zbog postojanja posebnih okolnosti u različitim tehnološkim i socio-ekonomskim okruženjima. Ispitali smo grupu starijih studenata (3. i 4. godina) studijskog programa Informacione tehnologije, koji intenzivno koriste računarsku učionicu za različite predmete, i čiji jedan deo je već imao iskustvo u korišćenju sopstvenog uređaja na času. Rezultati pokazuju izuzetnu spremnost za korišćenjem sopstvenog računara. Velika većina studenata poseduje prenosivi računar i faktički nije iskazana nijedna prepreka uvođenju BYOD-a. Ovi nalazi mogu da ohrabre upravu fakulteta u smislu razmišljanja o ovakvom, inovativnom načinu poboljšanja nastavnog procesa.

Ključne reči: studenti; nastava; BYOD; obrazovanje; laptop.

Usability Testing in Human-Computer Interaction Classroom

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Abstract: Before launching a new product in the market, series of testing are preformed, in order to satisfy required demands. One of the criteria that needs to be fulfilled is usability testing, which consists of evaluation of products and services by users. Users are expressing their opinion by accomplishing previously defined tasks regarding difficulties they meet during product or service usage. In this paper, the most important concepts of usability and usability testing are explained. Also, basics of web usability, its definition and main website usability testing elements and methods are introduced. In addition, review of few popular and free usability testing tools, as well as a practical example of website usability testing process is presented. Nowadays, usability testing is very important part of the Human-computer interaction research and study.

Keywords: Usability testing; Human-computer interaction; Evaluation; Web usability.

Testiranje upotrebljivosti u procesu nastave Interakcija čovek-računar

Rezime: Pre pojavljivanja određenog proizvoda na tržištu vrši se niz testiranja kako bi se određeni kriterijumi zadovoljili. Jedan od kriterijuma koji je potrebno ispuniti je ispitivanje upotrebljivosti, što predstavlja evaluaciju proizvoda i usluga od strane korisnika. Nizom prethodno definisanih zadataka korisnici izražavaju svoje mišljenje o poteškoćama na koje nailaze prilikom korišćenja proizvoda ili usluge. U ovom radu biće pre svega objašnjeno šta se podrazumeva pod pojmovima upotrebljivost i testiranje upotrebljivosti, biće predstavljen koncept web usability – na šta se odnosi, koji elementi i metode ispitivanja se koriste, kao i načini i kriterijumi za ispitivanje upotrebljivosti web sajtova. Zatim će biti dat pregled nekoliko aktuelnih, besplatnih alata za testiranje upotrebljivosti, a potom i praktičan primer realizacije testiranja upotrebljivosti web sajtova. Testiranje upotrebljivosti je veoma važan deo u procesu nastave Interakcije čovek-računar.

Ključne reči: Testiranje upotrebljivosti; Interakcija između čoveka i računara; Evaluacija; Web upotrebljivost.

The Concept of Development of the Intelligent Tutoring System Sensitive to Emotions

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Abstract: This paper represents the contribution to the development of the intelligent tutor system sensitive to emotions. The proposal of the model of emotion recognition during the learning process, having in mind the necessary sensors and the emotion classification. The use of RBF neural network is suggested because of the simple and temporally hardly changeable nonlineral object approximation provided it is possible to place the center and determine the amounts of variables RBF neurons in advance, where the studying of the network can be reduced only to the settings of crucial coefficients in output layer.

Keywords: intelligent tutor systems; neural network; RBF networks.

Idejni koncept razvoja inteligentnog tutorskog sistema osetljivog na emocije

Rezime: Ovaj rad predstavlja prilog razvoju inteligentnog tutorskog sistema osetljivog na emocije. Daje se predlog modela prepoznavanja emocija tokom procesa učenja imajući u vidu potrebne senzore i načine klasifikovanja emocija. Predlaže se korišćenje RBF neuronske mreže zbog aproksimacija jednostavnih i vremenski malo promenljivih nelinearnosti kada je moguće unapred na odgovarajući način rasporediti središta i odrediti iznose varijanse RBF neurona, a učenje mreže se može svesti samo na podešavanja težinskih koeficijenata izlaznog sloja.

Ključne reči: inteligentni tutorski sistemi; neuronske mreže; RBF mreže.

Online Reading Strategies Use in English as a Foreign Language in Biotechnical Engineering

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Abstract: The paper examines the use of reading strategies by biotechnology engineering students when reading English texts online. The study involved twenty undergraduate students learning English as a foreign language at University of Kragujevac, Serbia. The instruments used in the study were the Background Information Questionnaire and Survey of Online Reading Strategies. The participants' overall use of online reading strategies is at the medium level. The obtained results also demonstrate that the most prominent online EFL reading strategies involve trying to maintain focus when losing concentration, reading slowly and carefully in order to understand the online text better, using reference materials for better understanding when reading online, and paying closer attention to what is read when reading difficult online texts. Significant gender differences are found with four online reading strategies: overviewing the online text to see what it is about, confirming the purpose of reading, guessing the content of the online text, and self-questioning about the online text.

Keywords: biotechnology engineering; English as a foreign language; online reading; reading strategies.

Primena onlajn strategija čitanja na engleskom jeziku u biotehnoškom inženjerstvu

Rezime: U radu se ispituje primena strategija čitanja u onlajn okruženju na engleskom jeziku kao stranom u oblasti biotehnoškog inženjerstva. Istraživanje je obuhvatilo dvadeset studenata osnovnih studija biotehnoškog inženjerstva koji uče engleski jezik kao strani na Univerzitetu u Kragujevcu, Srbija. Instrumenti u istraživanju su Opšti upitnik i Skala strategija čitanja na engleskom jeziku u onlajn okruženju. Studenti budući inženjeri biotehnologije umereno primenjuju strategije čitanja u onlajn okruženju. Dobijeni rezultati ukazuju da studenti najčešće primenjuju sledeće strategije čitanja na engleskom jeziku u onlajn okruženju: nastoje da se skoncentrišu kada izgube koncentraciju pri čitanju teksta na engleskom jeziku, čitaju polako i pažljivo kako bi bili sigurni da razumeju pročitani tekst, koriste reference kako bi bolje razumeli tekst i obraćaju veću pažnju na ono što čitaju kada tekst u onlajn okruženju postane težak za razumevanje. Statistički značajne polne razlike su otkrivene u primeni sledećih strategija čitanja na engleskom jeziku u onlajn okruženju: pregledanje teksta pogledom pre detaljnog čitanja radi poimanja sadržaja, proveravanje da li sadržaj teksta odgovara ciljevima čitanja, pogađanje sadržaja teksta i postavljanje pitanja sebi o tekstu na koje bi uspitanci želeli da dobiju odgovore.

Ključne reči: biotehnoško inženjerstvo; engleski jezik kao strani; čitanje u onlajn okruženju; strategije čitanja.

Mechanism for migrating data in relational databases

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Abstract: In this paper, we will describe mechanisms for data migration to relation databases, which can be found on the market today. Database practical use in teaching at the Faculty of Education in Bijeljina is on courses Informatics (for the first year of study) and Internet programming (in third year of studies). On these two courses, the students meet with relational databases and based on the communication of lecturers to students determining that there is about 80% of them first-time encounters with this subject matter. Relation Database Management System-RDBMS that will be used on concrete examples is Microsoft Access and MySQL. The aim of this research paper is to provide a software mechanism to students for migration data in MySQL Database with usage on previous knowledge about Access-a database. We will describe methods for migration of data from Access-a into MySQL databases. For practical example we will use, MS Access 2010 in combination with graphical interface, MySQL Workbench 6.3 CE.

Keywords: Access; MySQL; RDBMS; Workbench; Export.

Mehanizam za migraciju podataka u relacionim bazama podataka

Rezime: U ovom radu ćemo opisati mehanizme za migraciju podataka u relacionim bazama podataka koje se danas mogu naći na tržištu. Praktična upotreba baza podataka u nastavi na Pedagoškom fakultetu u Bijeljini je na predmetima Informatika (na prvoj godini studija) i Internet programiranje (na trećoj godini studija). Na ova dva kursa učenici se susreću sa relacionim bazama podataka i na osnovu komunikacije predavača sa studentima utvrđeno je da se oko 80% studenata prvi put susreće sa ovom tematikom. Sistemi za upravljanje relacionim bazama podataka (SURBP) koji će se koristiti na konkretnim primjerima su Microsoft Access i MySQL. Cilj ovog istraživačkog rada je da pruži softverski mehanizam studentima za migraciju podataka u MySQL bazu podataka koristeći prethodno znanje o bazama podataka u Access-u. Mi ćemo opisati metode za migraciju podataka iz Access-a u MySQL baze podataka. Za praktičan primjer ćemo koristiti MS Access 2010 u kombinaciji sa grafičkim interfejsom, MySQL Workbench 6.3 CE.

Ključne reči: Access, MySQL, RDBMS, Workbench, Izvoz.

Information system for obtaining reports on students of the High Technical School of Vocational Studies from Urosevac in Leposavić

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Abstract: The paper presents the information system of the student service of the High Technical School of Vocational Studies from Urosevac in Leposavic, realized with the MS Office Access software package. Thus, created database provides the ability to obtain the necessary reports to monitor the progress of students in their studies and reports that can be used with statistical analyzed higher education institutions, which can be later used in the self-evaluation report and other various reports.

Keywords: MS Office Access; information system; the report; database.

Informacioni sistem za dobijanje izveštaja o studentima Visoke tehničke škole strukovnih studija iz Uroševca u Leposaviću

Rezime: U radu je prikazan informacioni sistem studentske službe Visoke tehničke škole strukovnih studija iz Uroševca u Leposaviću realizovan pomoću programskog paketa MS Office Access. Ovako kreirana baza pruža mogućnost dobijanja izveštaja potrebnih za praćenje napredovanja studenata u toku studija, kao i izveštaje koji mogu poslužiti sa statističku analizu visokoškolske ustanove koja se može kasnije koristiti u izveštaju o samovrednovanju i drugim raznim izveštajima.

Ključne reči: MS Office Access; informacioni sistem; izveštaj; baza podataka.

Knowledge Bases in the Field of Expert Systems and Artificial Intelligence

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Abstract: This paper presents analysis of existing knowledge bases in the field of expert systems and artificial intelligence, i.e. published standards, web site eXpertise2Go, as well as standardized and non-standardized glossaries. Analysis was performed by searching the available knowledge bases in order to find a complete knowledge bases for the area. According to the results obtained ISO has published the highest number of standards, eXpertise2Go is the most consistent website with information about using and building expert systems, and there are glossaries which are accessible and free to readers related with expert systems and artificial intelligence.

Keywords: knowledge base, expert systems, artificial intelligence, standards, glossaries.

Baze znanja u oblasti ekspertnih sistema i veštačke inteligencije

Rezime: Ovaj rad predstavlja analizu postojećih baza znanja u oblasti ekspertnih sistema i veštačke inteligencije kao što su: objavljeni standardi, veb-sajt eXpertise2Go i standardizovani i nestandardizovani rečnici. Analiza je izvršena pretraživanjem dostupnih baza znanja, kako bi se pronašla potpuna baza znanja za datu oblast. Na osnovu dobijenih rezultata ISO je objavio najveći broj standarda, veb-sajt eXpertise2Go je najsadržajjniji sajt sa informacijama za upotrebu i izradu ekspertnih sistema, i postoje rečnici koji su dostupni i besplatni čitaocima u oblasti ekspertnih sistema i veštačke inteligencije.

Ključne reči: baza znanja, ekspertni sistemi, veštačka inteligencija, standardi, rečnici.

An Analysis of User's Information Security Awareness

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Abstract: In modern systems information security is having an increased importance for organizations. With the advance of technology and implementation of guidelines for protecting systems, it is a lot harder for malicious entities to gain access to the system. However, one of the main attack vectors is the user, as such it is important for users to be knowledgeable and behave in a way that will have a positive influence in protecting information. It's important for organizations to understand the awareness of users in order to be able to take appropriate actions to increase the safety of the system. This paper is going to do an analysis of user awareness specifically focusing on user's knowledge and behaviour. Results of this analysis show us that the current level of user awareness of the Municipal Administration is satisfactory and that age is not important factor for awareness. Information security training is advised, but not necessary.

Keywords: Information security, user awareness, information management.

Analiza svesti korisnika o bezbednosti informacija

Rezime: U modernim sistemima informaciona bezbednost ima veći značaj za organizacije. Sa napredovanjem tehnologija i implementacijom smernica za zaštitu sistema, mnogo je teže za zlonamerne entitete da dobiju pristup sistemu. Međutim, jedan od glavnih vektora napada je korisnik, time je važno da su korisnici informisani i da se ponašaju na način koji će imati pozitivan uticaj na zaštitu informacija. Važno je da organizacije razumeju svest korisnika kako bi mogle preduzeti odgovarajuće mere kako bi povećale bezbednost sistema. U ovom radu je urađena analiza svesti korisnika, specifično fokusirano na informisanost i ponašanje korisnika. Rezultati ove analize pokazuju da je trenutni nivo korisničke svesti opštinske uprave zadovoljavajući i da starost nije važan faktor. Obuka za bezbednost informacija se savetuje, ali nije neophodna.

Ključne reči: Bezbednost informacija, svesnost korisnika, uravljanje informacija.

Benchmark of Web Browsers with Automated Testing Tool

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Abstract: The paper investigates method of benchmark of four web browsers against open source Automation Testing tool Selenium web driver. We will present two test scenarios and in both of them it is necessary to generate an automated test using the C# programming language, in combination with the Selenium web driver. The aim of this research paper is to evaluate and compare execution time for automated test setup against four web browsers to determine their usability and effectiveness. Based on the presented scenarios and described procedures, we will show that Microsoft has seriously approached resolving the deficiencies that existed on Internet Explorer, and that Edge has become a competitive browser, at least when we are talking about test executing, which has not been the case with Internet Explorer so far.

Keywords: Benchmark; Selenium web driver; Automated test; C# programming language.

Benčmark internet pretraživača korištenjem alata za automatsko testiranje

Rezime: U ovom radu istražuju se metode pokretanja automatskih testova na četiri različita internet pretraživača, koristeći alat za automatsko testiranje baziran na selenium veb drajveru. Predstavićemo dva testna scenarija, u oba će postojati automatski test koji je napisan u C# programskom jeziku, u kombinaciji sa selenium veb drajverom. Cilj ovog istraživačkog rada je izračunavanje i poređenje vremena izvršenja automatskih testova na četiri različita internet pretraživača, kako bi se utvrdila njihova upotrebljivost i efikasnost. Na osnovu predstavljenih scenarija i opisanih procedura, pokazaćemo da se Microsoft ozbiljno posvetio rješavanju nedostataka koji su postojali na Internet Explorer-u i da je Edge postao konkurentan pretraživač, barem kad je pokretanje testova u pitanju, što do sad nije bio slučaj sa Internet Explorer-om.

Ključne reči: Benčmark, Selenium veb drajver, Automatski test, C# programski jezik.

Software Testing Course in IT Undergraduate Education in Serbia

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Abstract: In the last two decades, with the establishment of Information Technology (IT) departments in Serbian universities, the need for having Software Testing courses has also emerged. In this paper Software Testing is considered as an important subject but is not widely offered in many IT programs. Some faculties have one or more software testing courses in undergraduate studies, but some of them not. The Faculty of Technical Science in Čačak has IT studies, but in old curriculum doesn't have Software Testing course. Here we proposed program for this course which will be elective course on last year of studies. Also, it is present the importance of this course for student to find job position in domain of software testing.

Keywords: software testing; student; education; information technology (IT).

Zastupljenost predmeta Testiranje softvera na IT smerovima visokog obrazovanja u Srbiji

Rezime: Poslednje dve decenije sa nastankom informacionih tehnologija (IT) na univerzitetima u Srbiji, pojavila se potreba za uvođenjem predmeta Testiranje softvera. U radu se Testiranje softvera razmatra kao izuzetno značajan predmet na IT smerovima, ali na velikom broju fakulteta koji školuju IT stručnjake u Srbiji ne postoji taj predmet u nastavnim planovima. Fakultet tehničkih nauka u Čačku ima akreditovane smerove koji se odnose na IT studije već duži niz godina, ali je tek u poslednjoj akreditaciji uveden ovaj predmet. U okviru starog studijskog programa nije bio zastupljen, pa je predlog autora rada da se od naredne školske godine ovaj predmet uvede kao izborni u četvrtoj godini studija. Značaj predmeta se ogleda u mogućnosti pronalaženja posla u oblasti testiranja softvera, jer su softveri sve složeniji i obavezna je primena metoda testiranja od početka razvoja softvera.

Ključne reči: testiranje softvera, student, obrazovanje, informacione tehnologije (IT).

Teaching Adaptability and Code Reuse of Web Applications with the N-tier Architecture: Case study in VS.NET

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Abstract: This paper presents results in exploring research in development of adaptable software and teaching in this field, with special concern on using n-tier web programming as an example. The model of teaching n-tier web programming is based on introducing software components organized in layers (data layer, business logic layer, service layer and presentation layer) and sub-layers within each layer. This model enables adaptability of software to changes, including changes of DBMS, business rules etc. The proposed model is compared with existing industry standard architectures, such as MVC (model-view-controller). The proposed approach is explained with a case study of n-tier ASPX/MSSQL web application.

Keywords: adaptable software; n-tier programming, web programming, teaching, MVC.

Poučavanje adaptibilnosti i ponovne iskoristivosti programskog koda web aplikacija primenom višeslojne arhitekture: studija slučaja u VS.NET razvojnom okruženju

Rezime: U ovom radu prezentovani su rezultati izučavanja istraživanja u oblasti razvoja adaptibilnog softvera i nastave u ovoj oblasti, sa posebnim osvrtom na višeslojno web programiranje, kao jedan od primera. Model nastave u oblasti višeslojnog web programiranja je baziran na uvođenju softverskih komponenti organizovanih u slojeve (sloj za rad sa podacima, sloj poslovne logike, sloj servisa, prezentacioni sloj) i podslojeve u okviru svakog sloja. Ovaj model omogućava adaptibilnost softvera na promene, uključujući promene sistema za upravljanje bazom podataka, poslovnih pravila itd. Model koji je predložen u ovom radu je upoređen sa postojećim industrijskim standardnim arhitekturama, kao što je MVC (model-view-controller). Predloženi pristup je obrazložen studijom slučaja, tj. primerom višeslojne ASPX/MSSQL web aplikacije.

Ključne reči: adaptibilni softver, višeslojno programiranje, web programiranje, poučavanje, MVC.

One MCDM Approach to Learning Management Systems Evaluation

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Abstract: In the paper are presented and also illustrated on a practical example possibility of applying one MCDM approach to evaluation of the Learning Management Systems (LMSs) as an important tool in achieving more efficient educational processes. This study proposes a Fuzzy Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) approach to support evaluation of LMSs under fuzzy environment. The proposed approach enables decision makers to identify the alternative, which is closest to the ideal solution and provide more accurate and effective decision support tool, also by implementation of the fuzzy set theory within the TOPSIS process the problems of vagueness and ambiguity are solved.

Keywords: Learning Management System; MCDM approach; Fuzzy TOPSIS method.

Jedan višekriterijumski pristup evaluaciji Learning Management Systems

Rezime: U radu je predstavljen i na praktičnom primeru ilustrovan višekriterijumski pristup evaluaciji Learning Management Systems (LMSs) kao značajnog sredstva za postizanje efikasnijih obrazovnih procesa. Rad predlaže primenu pristupa baziranog na Fuzzy Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) kao efikasnu podršku evaluaciji LMSs pod uslovima neodređenosti. Predloženi pristup donosi odluka omogućava da identifikuju alternativu koja je najbliža idealnom rešenju i predstavlja precizan i efikasan alat za podršku odlučivanju, takođe implementacijom Fuzzy set teorije u okviru tradicionalnog TOPSIS procesa moguće je rešiti problem neodređenosti i dvosmislenosti pri odlučivanju.

Ključne reči: Learning Management System; višekriterijumski pristup odlučivanju; Fuzzy TOPSIS metoda.

Possibility of Deploying COSMOS Operating System on Personal Computers

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Abstract: Knowing the concept and way of implementation of the operating systems is one of the most important tasks that computer experts should meet. Therefore, educational versions of operating systems are being designed and implemented. The development of such operating systems provides the opportunity for interested parties to become familiar with the possibilities of using various software tools for their realization. An example of such educational operating system is a set of program modules known as COSMOS. Modules are written in C# programming language and Visual Studio development environment is used for their translation and integration into a unique system.

Keywords: Operating systems; education; development environment; programming languages.

Mogućnost pokretanja COSMOS operativnog sistema na ličnim računarima

Rezime: Poznavanje koncepta i načina implementacije operativnih sistema je jedan od najvažnijih zadataka koji računarski stručnjaci treba da zadovolje. Samim tim, razvijaju se edukativne verzije operativnih sistema. Razvoj ovih operativnih sistema je prilika za zainteresovane pojedince da se upoznaju sa mogućnostima upotrebe različitih softverskih alata za njihovu realizaciju. Primer ovakvog operativnog sistema je skup programskih modula pod imenom COSMOS. Moduli se mogu pisati u programskom jeziku C#, a Visual Studio razvojno okruženje se koristi za njihovo prevođenje i integraciju u jedinstven sistem.

Ključne reči: Operativni sistemi, obrazovanje, razvojno okruženje, programski jezici.

A Mathematical Learning Environment Based on Serbian Language Resources

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Abstract: In recent years, in line with ever growing usage of Information technology, the learning environments are changing. The amount of available learning materials in various forms has increased. These new environments demand comprehensive learning systems, which enable management of the learning corpus with special attention paid to relevant lexical resources. In this paper we present the concept of a Mathematical Learning Environment in Serbian (MLES), which is based on a corpus of mathematical materials and various lexical resources, enabling semantic search of mathematical content. A specific use of the system is mathematical support in solving real life problems from engineering practice. To that end complex issues had to be resolved, such as mathematical text analysis, processing of mathematical content in different formats, search of mathematical materials, indexing of mathematical content using Serbian lexical resources, issues that are further complicated due to rich Serbian morphology. This paper outlines the structure and solutions for MLES, as well as the main features of its already developed components.

Keywords: mathematical content; text processing; mathematical formulae.

Matematičko okruženje za učenje zasnovano na srpskim jezičkim resursima

Rezime: U poslednjih nekoliko godina u skladu sa porastom korišćenja informacionih tehnologija, menjaju se okruženja za učenje. Količina dostupnog materijala za učenje koji je u različitim formama se povećala. Nova okruženja zahtevaju sveobuhvatne sisteme za učenje, koji omogućavaju upravljanje korpusom za učenje uz posebnu pažnju posvećenu relevantnim leksičkim resursima. U ovom radu predstavljen je koncept Matematičkog okruženja za učenje na srpskom (MLES), koji je zasnovan na korpusu matematičkih materijala i raznim leksičkim resursima, time omogućujući semantičku pretragu matematičkog sadržaja. Specifična upotreba sistema je matematička podrška u rešavanju stvarnih problema iz inženjerske prakse. U tu svrhu morala su biti rešena složena pitanja, kao što su analiza matematičkog teksta, obrada matematičkih sadržaja u različitim formatima, pretraživanje matematičkih materijala, indeksiranje matematičkog sadržaja pomoću srpskih leksičkih resursa kao i pitanja koja su dodatno komplikovana zbog bogate srpske morfologije. Ovaj rad opisuje strukturu i rešenja za MLES, kao i glavne karakteristika svojih već razvijenih komponenti.

Ključne reči: matematički sadržaj; obrada teksta; matematičke formule.



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SESSION III
**ENGINEERING EDUCATION
AND PRACTICE**

Notes:

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Financial Literacy of Engineering Students - Waiting for PISA 2018 Results in Serbia

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Abstract: Financial literacy is one of the necessary skills for all professionals in 21st century. Engineering students who are finishing their undergraduate studies are expected to be the leaders of development of every country, so it is important to investigate their level of financial literacy. The main goal of this research is to examine financial literacy of university students at engineering study programs using PISA methodology. The sample consisted of 71 engineering students of Faculty of technical sciences in Čačak, Serbia. The questionnaire consisted of examples of PISA financial literacy assessment questions described in detail in PISA 2015 Results; it consisted of 11 tasks, measuring five proficiency levels of financial literacy. The results show that majority of engineering students perform at Level 4 of financial literacy. Regarding the content of financial literacy, the results suggest that money and transactions as well as planning and managing finances are the content categories that are more familiar to engineering students, while risk and reward and financial landscape are more challenging to them. Limitations and further educational implications of this research are discussed.

Keywords: Financial literacy; engineering students; PISA research.

Finansijska pismenost studenata inženjerstva - u iščekivanju rezultata PISA 2018 istraživanja u Srbiji

Rezime: Finansijska pismenost je jedna od neophodnih veština za sve profesije u 21. veku. Od studenata inženjerstva koji su na završnim godinama studija se očekuje da budu lideri razvoja svoje zemlje, pa je važno istražiti njihov nivo finansijske pismenosti. Glavni cilj ovog istraživanja je ispitati nivo finansijske pismenosti studenata inženjerskih studijskih programa koristeći PISA metodologiju. Uzorak čini 71 student inženjerskih studijskih programa Fakulteta tehničkih nauka u Čačku, Srbija. Upitnik čine primeri pitanja iz PISA upitnika za procenu finansijske pismenosti opisanih u rezultatima istraživanja PISA 2015; sastoji se iz 11 zadataka, koji mere pet nivoa finansijske pismenosti. Rezultati pokazuju da je većina studenata inženjerstva na četvrtom nivou finansijske pismenosti. Uzimajući u obzir sadržaj pismenosti, rezultati pokazuju da su novac i transakcije, kao i planiranje i upravljanje finansijama područja sadržaja koja su najpoznatije studentima, dok su rizik i nagrade i finansijsko okruženje najizazovnije. Ograničenja i dalje implikacije za obrazovnu politiku ovog istraživanja su diskutovane.

Ključne reči: finansijska pismenost; studenti inženjerstva; PISA istraživanje.

Dual/Cooperative Education in Higher Education

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Abstract: Learning cycles in experiential education show a striking similarity to the plan-do-check-act-cycle in corporate problem solving. These similarities from plan-do-check-act-cycle to learning were realized in the development of a dual/cooperative study program "Production Technology and Organization" at University of Applied Sciences FH Joanneum. From the beginning in 2002 the dual/cooperative study program "Production Technology and Organization" had a strong emphasis on integrating small and medium sized enterprises with little or no previous cooperation with higher education. Dual education is a good option to educate young engineers for future challenges within a company. Several of the partner companies had not yet hired a college graduate but agreed to help educate students through dual/cooperative education. The paper will present strategies and methods which were developed at study program of "Production Technology and Organization" and applied to meet growing requests from partner companies to extend this interaction to a wide range of issues, always concerning improvement and innovation in product development and production processes. Meanwhile the dual/cooperative study program and the dual students play a central role in the Austrian industry – university relationship at FH JOANNEUM and for other regional universities. Dual education has opened a completely new and innovative channel to small and medium sized enterprises regarding the promotion of innovation. The presentation shows the experiences in Austria, comparing them with activities at other universities and generating new ideas for further improvement of the role of dual programs as a partner to regional industry in coping with the present economic crisis in nations.

Keywords: dual education, production technology and organization, university of applied sciences, networking, partnership to industry.

Dualno/kooperativno obrazovanje u visokom obrazovanju

Rezime: Ciklus učenja u eksperimentalnom obrazovanju pokazuje neverovatnu sličnost sa PDCA ciklusom kod rešavanja korporativnih problema. Ovakve sličnosti između PDCA ciklusa i učenja su ostvarene kroz razvoj dualnog/kooperativnog studijskog programa "Tehnologija i organizacija proizvodnje" na Univerzitetu Primenjenih Nauka FH Joanneum. Od samog početka 2002. godine, dualno/kooperativni studijski program "Tehnologija i organizacija proizvodnje" je naglašavao integraciju visokog obrazovanja i malih i srednjih preduzeća koja su do tada pokazivala mali stepen saradnje ili pak, nimalo saradnje. Dualno obrazovanje je dobar način za obrazovanje mladih inženjera za buduće izazove u okviru kompanija. Nekoliko partnerskih kompanija još uvek nije angažovalo kandidata sa završenim fakultetom, već su odlučili da daju doprinos u obrazovanju studenata kroz dualno/kooperativno obrazovanje. U radu će biti predstavljene strategije i metode koje su razvijene na studijskom programu "Tehnologija i organizacija proizvodnje" i primenjene u cilju zadovoljenja sve veće potrebe partnerskih kompanija za proširenje ove interakcije na širok spektar problema koji se uvek odnose na napredak i inovacije u razvoju proizvoda i proizvodnih procesa. U međuvremenu, dualno/kooperativni studijski program i studenti sa ovog programa imaju ključnu ulogu u austrijskoj privredi – za saradnju sa univerzitetom na FH JOANNEUM i drugim lokalnim univerzitetima. Dualno obrazovanje je otvorilo potpuno nov i inovativni put za mala i srednja preduzeća u vezi sa promocijom uvođenja novina. Ova prezentacija pokazuje iskustva u Austriji, koja su upoređena sa aktivnostima na drugim univerzitetima i koja stvaraju nove ideje za dalje unapređenje uloge dualnih programa kao partnera lokalne privrede u savladavanju aktuelne ekonomske krize širom sveta.

Ključne reči: dualno obrazovanje, tehnologija i organizacija proizvodnje, univerzitet primenjenih nauka, umrežavanje, od partnerstva do privrede.

Innovation of University Courses in the Field of Manufacturing Technologies Based on the Implementation of Dual Education

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Abstract: In this paper is presented the project that was realized within the framework of the activity "Development of higher education". The project is supported and financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia. The project is a set of activities to improve theoretical and practical content of teaching courses belonging to the field of manufacturing technologies, through the implementation of dual education. Teaching courses, whose improvement is the aim of the project, exist on the bachelor and master studies Mechatronika at the Faculty of Technical Sciences Čačak.

Keywords: higher education, manufacturing technologies, practice, dual education.

Inoviranje nastavnih predmeta iz oblasti proizvodnih tehnologija zasnovano na implementaciji dualnog obrazovanja

Rezime: U radu je predstavljen projekat koji je realizovan u okviru aktivnosti "Razvoj visokog obrazovanja". Projekat je podržalo i finansiralo Ministarstvo prosvete, nauke i tehnološkog razvoja Republike Srbije. Projekat predstavlja niz aktivnosti za unapređenje teorijskog i praktičnog sadržaja nastavnih predmeta iz oblasti proizvodnih tehnologija, kroz implementaciju dualnog obrazovanja. Nastavni predmeti, čije je unapređenje cilj projekta, prisutni su na osnovnim i master studijama Mehatronike na Fakultetu tehničkih nauka u Čačku.

Ključne reči: visoko obrazovanje, proizvodne tehnologije, praksa, dualno obrazovanje.

A constructive approach to teaching with Robotino®

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Abstract: The current level of technological development and an increasing need for Information Technology (IT) staff open up opportunities and impose a need for a different approach in students' education. Instead of classical, theoretically-oriented, transfer of finished knowledge, the focus is put on interactive learning through student's own experimental work. Modern mechatronic systems offer the possibility of changing the way of acquiring technological knowledge and developing programming skills. This paper presents some possibilities of mobile robotic system Robotino® of Festo Didactic intended for education and research. It is an open, flexible learning, platform that enables entry into the world of mechatronics and information technology for students of a different level of prior knowledge. In the paper, more details are given about the drive subsystem.

Keywords: education; Robotino®; mobile robot; drive system.

Konstruktivistički pristup učenju pomoću Robotina®

Rezime: Postojeći nivo tehnološkog razvoja i rastuća potreba za stručnjacima informacionih tehnologija (IT) pružaju mogućnosti i nameću potrebu za drugačijim pristupom u obrazovanju studenata. Umesto klasičnog, teoretski-orijentisanog, transfera gotovih znanja, težište se stavlja na interaktivno učenje kroz eksperimentalan rad studenata. Savremeni mehatronički sistemi pružaju mogućnost promene načina sticanja tehnoloških znanja i sticanja programerskih veština. U radu se prikazuju neke od mogućnosti mobilnog robotskog sistema Robotino® firme Festo Didactic namenjenog obrazovanju i istraživanju. To je jedna otvorena, fleksibilna, platforma za učenje koja studentima različitih nivoa predznanja otvara put u svet mehatronike i informacionih tehnologija. U radu se detaljnije govori o pogonskom podsistemu.

Ključne reči: obrazovanje; Robotino®; mobilni robot; pogonski sistem.

Application of the RobotStudio software package for programming assembly robots

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Abstract: Changes in world trade in goods and services, directed towards the globalization of the market and the desire of manufacturers to meet the demands of each individual customer, imposes ever more stringent demands on existing technology systems. The application of robotic systems in assembly significantly improves the performance of this technological system, reduces the time of assembly, increases the productivity and quality of assembled products. The paper presents the application of the RobotStudio software package for programming the work of the robot for assembly. An analysis of the assembly technology of the sub-assembly of the shaft was done, which is necessary in order to get the code used by the robot in the software package.

Keywords: Robotic systems; robot programming; assembly; modelling.

Primena softverskog paketa RobotStudio za programiranje robota za montažu

Rezime: Promene u svetskom prometu robe i usluga, koje su usmerene prema globalizaciji tržišta i želji proizvođača da zadovolje zahteve svakog kupca, postavljaju sve strožije zahteve postojećim tehnološkim sistemima. Primena robotskih sistema značajno pospešuje performanse ovog tehnološkog sistema, skraćuje vreme montaže, povećava produktivnost kao i kvalitet sklopljenih proizvoda. U radu je predstavljena primena softverskog paketa RobotStudio za programiranje rada robota za montažu. Izvršena je analiza tehnologije montaže podsklopa osovine, neophodna za dobijanje robotskog koda u softverskom paketu.

Ključne reči: Robotski sistemi; robotsko programiranje; montaža; modelovanje.

Creating an Android Weather Forecast Application in the Android Studio

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Abstract: A large number of requests that can be made on a computer can now be realized on smartphones or tablets. Because of their high hardware performance, mobility and low cost, smart mobile devices take on the primacy of classical computers in many spheres of life. The smart mobile software market is rapidly increasing, and the need for experts in this field is enormous. In this paper an analysis of operating systems of mobile devices was performed, the most commonly used development environment for application programming, and the process of development of weather forecast application on the Android platform is shown.

Keywords: Android; Java; smartphones; application.

Kreiranje android aplikacije za vremensku prognozu u Android Studiju

Rezime: Veliki broj zahteva koji se može uraditi na računaru, danas se može realizovati na pametnim telefonima ili tablet uređajima. Zbog svojih visokih hardverskih performansi, mobilnosti i niske cene, pametni mobilni uređaji preuzimaju primat od klasičnih računara u mnogim sferama života. Tržište softvera za pametne mobilne uređaje se rapidno uvećava, te su potrebe za stručnjacima iz ove oblasti ogromne. U ovom radu je izvršena analiza operativnih sistema mobilnih uređaja, navedena su najčešće korišćena razvojna okruženja za programiranje aplikacija i prikazan je postupak razvoja aplikacije za vremensku prognozu na Android platformi.

Ključne reči: Android; Java; pametni uređaji; aplikacija.

Simulations of Analog Circuits in Multisim Software Suite

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Abstract: In the field of Electrical Engineering students' education, the experiments including hardware and software components have an important role. Students mostly gain theoretical knowledge with some or none actual experience, so the development of various simulations if the actual hardware is unavailable can in some part satisfy the need for the practice. In this paper, we elaborated the topic of creating simulations of real analog circuits in Multisim software suite, and their analysis with NI Elvis II+ hardware platform. The students were interviewed about their opinion on these simulations, and their answers confirmed their satisfaction with the realized experiments.

Keywords: analog circuits; hardware simulations; Multisim; NI Elvis II+; software simulations.

Simulacije analognih kola u "Multisim" softverskom paketu

Rezime: U oblasti obrazovanja studenata elektrotehnike, eksperimenti koji sadrže i hardverske i softverske komponente su od velike važnosti. Studenti uglavnom stižu teorijska znanja, uz malo ili nimalo praktičnog iskustva, tako da razvoj različitih simulacija, ako realan hardver nije dostupan, može u određenoj meri zadovoljiti potrebe studenata za praksom. U ovom radu, bavimo se tematikom kreiranja simulacija stvarnih analognih kola u Multisim softverskom paketu i njihovom analizom korišćenjem NI Elvis II+ hardverske platforme. Studenti su anketirani kako bi se prikupilo njihovo mišljenje o ovim simulacijama, a njihovi odgovori su potvrdili zadovoljstvo sa realizovanim eksperimentima.

Ključne reči: analogna strujna kola; hardverske simulacije; Multisim; NI Elvis II+; softverske simulacije.

Differences in Radio Broadcasting between Europe and America: two Separate Models and the Advent of the Digital Audio Broadcasting System

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Abstract: The analog model of RF broadcasts was a domain more or less easily regulated by policy makers and the state authorities involved in the terrestrial range of its service provision. Channels were granted to legal entities or entrepreneurial consortia that were subject to public law applicable in that region. However, the advent of new mobile and digital technologies creates an amalgam of free on-line media providers and expensive, state regulated public goods that attests general state provisions to be scornful to many ambiguities and legislative gaps. Contemporary technology forcibly trends to deregulated models of supply and demand, with mixed results thus far. Diminished entities get, as of now, the better.

Keywords: European and American Models of Broadcasting Services, Mobile and Digital Technologies, Radio Frequency Transmissions.

Razlike u emitovanju radio signala između Evrope i Amerike: dva posebna modela i uvođenje emisije digitalnog audio signala

Rezime: Domen analognog modela emisije radio signala bio je više ili manje jednostavno regulisan zakonodavstvom i državnim službama zaduženim za kontrolu emisije u specifičnim frekventnim opsezima. Kanali za emisiju obezbeđivani su od strane legislative ili konzorcijuma u skladu sa regionalnim zakonima. Sa druge strane, razvoj novih mobilnih i digitalnih tehnologija kreirao je mešavinu besplatnih online medija i skupih javnih dobara koje reguliše država čime je otvoren prostor za mnoge nejasnoće i zakonske praznine. Savremena tehnologija se kreće ka deregulaciji modela ponude i potražnje sa mešovitim rezultatima. Smanjenje entiteta se za sada pokazalo boljim rešenjem.

Ključne reči: Evropski i Američki modeli sistema emitovanja, Mobilne i digitalne tehnologije, Transmisija radio frekvencija.

Arduino Platform Capabilities in Multitasking Environment

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Abstract: Arduino platforms are one of the most popular bases for the development of embedded devices. The ability to independently design an interface with the environment, gives the Arduino modules characteristics of an "open hardware" device. At the same time, the existence of the Arduino IDE development environment enables easy and stable development of software. The structure of the Arduino program does not provide direct support for the operation of such devices in the multitasking environment. This problem has been partially overcome by the development of libraries, such as, for example, a library that allows the use of the FreeRTOS concept with the Arduino device. The paper presents the elements of realization of multitasking in the Arduino system operations with the support of the FreeRTOS system concept.

Keywords: Arduino concept; multitasking; real – time operating systems; integrated development environment.

Mogućnosti Arduino platforme u višeprogramskom okruženju

Rezime: Arduino platforme su jedne od najpopularnijih razvojnih okruženja za razvoj mikrokontrolerskih uređaja. Mogućnost za nezavisan dizajn interfejsa sa okruženjem daje Arduino modulima osobine uređaja sa "otvorenim hardverom". U isto vreme, postojanje Arduino IDE okruženja za razvoj aplikacija omogućava lak i brz razvoj softvera. Struktura Arduino programa ne pruža direktnu podršku za rad ovakvih uređaja u višeprogramskom okruženju. Ovaj problem je delimično rešen razvojem biblioteka, kao što je, na primer, biblioteka koja omogućava korišćenje FreeRTOS koncepta sa Arduino uređajima. Ovaj rad prikazuje elemente realizacije višeprogramskog rada u Arduino sistemu uz podršku koncepta FreeRTOS operativnog sistema.

Ključne reči: Arduino koncept, multitasking, RTOS, integrisano razvojno okruženje.

Raspberry Pi Module Clustering and Cluster Application Capabilities

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Abstract: The development of semiconductor technology and, consequently, the development of microcomputers created the conditions for adequate support for embedded parallelism in procedures for solving various problems in science and technology. With the simultaneous development of computer networks, conditions have been created for microcomputers to connect to clusters, which today are one of the pillars for the realization of parallel calculations. Raspberry Pi computer modules represent a good basis for cluster formation and support for parallel computing. The support of these computing practice in parallel computing is most often carried out with the support of the MPI (Message Passing Interface) concept.

Keywords: Parallel Computing; computer cluster; Raspberry Pi; message passing interface.

Klasterizacija Raspberry Pi modula i mogućnosti primene klastera

Rezime: Razvoj poluprovodničke tehnologije i mikroračunara doveo je do uslova za implementaciju odgovarajuće podrške za ugrađeni proceduralni paralelizam, radi rešavanja različitih problema u nauci i tehnologiji. Uporedo sa razvojem računarskih mreža, stvorili su se uslovi za povezivanje mikroračunara u klaster, koji danas predstavljaju jedan od nosilaca realizacije paralelnog računanja. Raspberry Pi računarski moduli predstavljaju dobru osnovu za kreiranje klastera i podršku za paralelno računanje. Paralelizacija se najčešće vrši uz podršku MPI koncepta prosleđivanja poruka.

Ključne reči: Paralelno računanje, računarski klaster, Raspberry Pi modul, interfejs za razmenu poruk.

Multifunctional Solar Park with “+Five in One”

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Abstract: This work describes photovoltaic solar park for family houses and residential objects with multifunction “+five in one” in range 10-100kWp. Key element of this system is Photovoltaic Converter unit which is realized as non-isolated photovoltaic string inverter with energy storage and uninterruptable power supply function. The control electronic of the inverter is described more detail in the paper. At this point, hardware of Electronic Control Module and base software were realized. The next steps of development are an energetic part of the inverters in IGBT and SiC technology, embedded software and web server.

Keywords: solar park; photovoltaic converter.

Multifunkcionalni solarni park sa “+pet u jedan”

Rezime: Ovaj rad predstavlja fotonaponski solarni park za porodične kuće i stambene objekte sa više funkcija „+pet u jedan” u rasponu 10-100kWp. Ključni element ovog sistema je fotonaponski konvertor koji je realizovan kao neizolovani fotonaponski mrežni inverter sa delom za skladištenje energije i funkcijom neprekidnog napajanja. U radu se detaljno opisuje kontrolna elektronika invertora. Za sada je realizovan hardver elektronskog upravljačkog modula i osnovni softver. Sledeći koraci podrazumevaju realizaciju energetskog dela invertora u IGBT i SiC tehnologiji, ugrađeni softver i veb server.

Ključne reči: solarni park; fotonaponski konvertor.

Photovoltaic Laboratory Trainer in Student Educations for Renewable Energy Sources

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Abstract: This paper describes a lab setting for a photovoltaic system which was delivered at the Faculty of Technical Science (FTS) in Kosovska Mitrovica and is now at the stage of preparation for teaching. The Photovoltaic Laboratory Trainer enables project work to be carried out with industrial components. The solar trainer permits realistic simulation of the progression of the sun. Emulators make it possible to carry out the experiments in the laboratory without the sun. The Interactive Lab Assist and Advanced Photovoltaic multimedia course is designed to convey the theoretical information and practical know-how, and performs the PC-supported evaluation of measurement data.

Keywords: Photovoltaic; renewable; educations.

Fotonaponska laboratorijska vežba u obrazovanju studenata iz obnovljivih izvora energije

Rezime: Ovaj rad opisuje laboratorijsku postavku za fotonaponske sisteme koja je dostavljena fakultetu tehničkih nauka (FTN) u Kosovskoj Mitrovici, i sada je u fazi pripreme za nastavu. Fotonaponska laboratorijska vežba omogućava projektovanje laboratorijskih rešenja koja se mogu ostvariti sa industrijskim komponentama. Fotonaponska laboratorijska vežba dozvoljava realnu simulaciju progresije sunca. Solarni emulator omogućava da se izvrše eksperimenti u laboratoriji bez sunca. Interaktivni Laboratorijski Asistent i napredni fotonaponski multimedijalni kurs su tako dizajnirani da prenose teoretska i praktična znanja, i vrše pripremu izmerenih podataka za njihovu obradu pomoću PC računara.

Ključne reči: Fotonaponski; obnovljivi; obrazovanje.

The Magnetoimpedance Effect and Principles of Measuring

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Abstract: This paper presents magnetoimpedance (MI) effects and the principles of measuring in order to exhibit the MI dependence on frequency and external magnetic field intensity. This phenomenon is not enough represented in Educational programs so this paper will be used as a learning material of basic concepts, influencing factors and the principles of measuring of MI effect. The obtained MI diagrams are shown for amorphous/nanocrystalline FINEMET type ferromagnetic $F_{e72}Cu_1V_4Si_{15}B_8$ ribbons and $Fe_{73}Cu_1Nb_3Si_{13.5}B_{9.5}$ microwires.

Keywords: MI effect, skin effect, amorphous/nanocrystalline ferromagnetic ribbons and microwires.

Magnetno-impedansni efekat i principi merenja

Rezime: Ovaj rad prezentuje magnetno-impedansni (MI) efekat, principe merenja i njegovu zavisnost od frekvencije i jačine spoljnog magnetnog polja. U obrazovnim programima nisu u dovoljnoj meri zastupljene teme koje proučavaju ovu pojavu, tako da će rad koristiti za upoznavanje sa osnovnim pojmovima, uticajnim faktorima, kao i metodama za merenje MI efekta. U radu su prikazani MI dijagrami za FINEMENT tip amorfni/nanokristalnih legura: feromagnetne $F_{e72}Cu_1V_4Si_{15}B_8$ trake i $Fe_{73}Cu_1Nb_3Si_{13.5}B_{9.5}$ mikrožice.

Ključne reči: MI efekat, skin efekat, amorfne/nanokristalne feromagnetne trake i mikrožice.

A tomographic method for determining the distance between standing wave anti-nodes and the frequency of electromagnetic radiation inside a microwave oven

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Abstract: The paper identifies the challenges of the tomographic method for determining the position and shape of the modes of the electromagnetic standing wave in a microwave oven. The experiment described here shows the inhomogeneity of heating and unpredictability of the occurrence of anti-nodes, or hot-spots, inside the microwave oven chamber, as well as a procedure for their better localization. The proposed tomographic method has been used for characterizing and visualizing standing wave modes. As part of the described experiment, an algorithm is presented to determine the optimal dimensions of the 3D chamber, which represent a resonator where the standing wave is formed. Also, a mathematical procedure for calculating the radius of the circle through the circle chord is described in detail, which was used to determine the distance between two neighboring anti-nodes of the standing wave.

Keywords: standing wave; microwave oven; anti-nodes; hot-spots; circle chord.

Tomografska metoda za određivanje rastojanja između trbuha stojećeg talasa i frekvencije elektromagnetskog zračenja u mikrotalasnoj pećnici

Rezime: U radu su predstavljeni izazovi koji se javljaju prilikom primene tomografske metode za određivanje položaja i oblika modova elektromagnetnog zračenja stojećeg talasa u mikrotalasnoj pećnici. Prikazani eksperiment pokazuje nehomogenost zagrevanja i nepredvidljivosti pojavljivanja trbuha, odnosno žarišnih tačaka u unutrašnjosti mikrotalasne pećnice, kao i proceduru za njihovu bolju lokalizaciju. Predložena tomografska metoda je iskorišćena i za karakterizaciju i vizuelizaciju modova stojećeg talasa. Kao deo opisanog eksperimenta, predstavljen je algoritam za određivanje optimalnih dimenzija 3D komore, koja predstavlja rezonator u kojem se formira stojeći talas. Takođe, detaljno je opisan matematički postupak za izračunavanje poluprečnika kruga iz poznavanja tetive kruga, koji se potom koristi za određivanje udaljenosti između dva susedna trbuha stojećeg talasa.

Ključne reči: stojeći talas; mikrotalasna pećnica; trbuh stojećeg talasa; žarišne tačke; tetiva kruga.

Educational Laboratory Setup for Electric Current Measurement Using Hall Effect Current Sensors

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Abstract: The aim of this paper is to present an educational laboratory setup for current measurement using current sensor Ametes-Senis CS10A-02, data acquisition card NI USB 6009 and personal computer with LabVIEW software. This current sensor module contains a single Hall effect sensor CSA-1V and accompanied electronic parts. The paper contains a brief description of the working principles of Hall effect sensors and the current sensor, presents its structure and technical details of interest. It also gives a description of a laboratory setup for measurements with current sensor, as well as a description of the used LabVIEW application. The paper presents the results of measurements and a proper discussion.

Keywords: Hall sensor; current sensor; open loop sensor; closed loop sensor; CS10A-02.

Edukativna laboratorijska postavka za merenja električne struje pomoću strujnog senzora baziranog na Holovom efektu

Rezime: Cilj ovog rada je prikaz edukativne laboratorijske postavke za merenje električne struje pomoću strujnog senzora Ametes-Senis CS10A-02, akvizicione kartice NI USB 6009 i personalnog računara sa LabVIEW softverom. Ovaj strujni senzorski modul sadrži jedan Holov senzor CSA-1V i dodatne elektronske delove. Rad sadrži kratke opise principa rada Holovog senzora i strujnog senzora, predstavlja kao i njihovu konstrukciju i tehničke detalje od interesa. Takođe, daje opis laboratorijske postavke za merenja sa strujnim senzorom, kao i opis korišćene LabVIEW aplikacije. U radu su prikazani rezultati merenja i odgovarajuća diskusija.

Ključne reči: Holov senzor; strujni senzor; senzor u otvorenoj petlji; senzor u zatvorenoj petlji; CS10A-02.

Virtual Instrumentation for Load Cell – Calibration and Measurements

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Abstract: The aim of this paper is to present a virtual instrument for load cell. This virtual instrument has been used for calibration of the load cell and for measurements of mass. The paper also presents details on the used load cell. Details on the produced balance that contains this sensor, its mechanical and electrical parts, have been also given in the paper. The paper contains measurement results and a proper discussion.

Keywords: load cell, balance, calibration, LabVIEW.

Virtuelna instrumentacija za mernu ćeliju - Kalibracija i merenja

Rezime: Cilj ovog rada je prikaz virtuelnog instrumenta za mernu ćeliju. Ovaj virtualni instrument je korišćen za kalibraciju merne ćelije i za merenje mase. U radu su prikazani detalji o korišćenoj mernoj ćeliji. Detalji o napravljenoj vagi koja sadrži ovaj senzor, njenim mehaničkim i električnim delovima su takođe dati u radu. Rad sadrži rezultate merenja i odgovarajuću diskusiju.

Ključne reči: merna ćelija, vaga, kalibracija, LabVIEW.

Application of Induction Machine U/f Control Through the Educational Laboratory Setup

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Abstract: This paper gives a description of a laboratory setup based on dSPACE1104 DSP board which allows development and testing different control algorithms of AC machines. A detailed description of the laboratory setup components as well as realization of the U/f control algorithm for an induction machine (IM) is presented in the paper. U/f control of IM is enabled by developed Graphical User Interface (GUI) application. The GUI provides observation of characteristic quantities during U/f control and emphasizes didactic character of the laboratory setup. The laboratory setup is intended for students who follow the course of control of electric drives and should enable more quality knowledge gain as well as enhance student's practical skills in the laboratory. At the end, obtained experimental results characterizing the IM operation under U/f control are presented.

Keywords: U/f control; dSPACE1104; induction machine; Rapid Control Prototyping; electric drive, laboratory setup, MATLAB/Simulink.

Aplikacija U/f kontrole asinhronne mašine kroz edukacionu laboratorijsku postavku

Rezime: Ovaj rad prikazuje opis laboratorijske postavke bazirane na dSPACE1104 DSP platformi koja omogućava razvoj i testiranje različitih upravljačkih algoritama mašina naizmjenične struje. Prikazan je detaljan opis svih komponenti laboratorijske postavke kao i realizacija U/f upravljačkog algoritma asinhronne mašine. U/f kontrola omogućena je razvojem aplikacije grafičkog korisničkog interfejsa (GUI). Realizovani grafički korisnički interfejs obezbeđuje monitoring karakterističnih veličina mašine za vreme U/f kontrole i naglašava didaktički aspekt laboratorijske postavke. Laboratorijska postavka namenjena je prvenstveno studentima koji pohađaju kurs Regulacije elektromotornih pogona i treba da omogući kvalitetnije usvajanje znanja kao i sticanje praktičnih veština pri radu u laboratoriji. Na kraju rada prikazani su dobijeni eksperimentalni rezultati karakteristični za rad asinhronne mašine pri U/f kontroli.

Ključne reči: U/f kontrola; dSPACE1104; asinhronna mašina; RCP; elektromotorni pogoni, laboratorijska postavka, MATLAB/Simulink.

Realization of Model of Robotic Arm S-430iF for Education Purposes

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Abstract: In this paper is presented development and realization of model of industrial robot S-430iF for educational purposes. Model of robotic arm is realized by using Matlab, SolidWorks, Arduino IDE software and rapid prototyping technology - 3D printing. Robotic arm described in this paper is cheap and user-friendly solution for students to adopt basic knowledge about mechanics of multibody systems, from simulation to implementation in real model.

Keywords: industrial robot, robotic arm model; MATLAB; Rapid Prototyping.

Izrada modela robotske ruke S-430iF za edukativne svrhe

Rezime: U ovom radu je prikazan razvoj i realizacija modela industrijskog robota S-430iF za edukativne svrhe. Model robotske ruke je realizovan primenom Matlab, SolidWorks, Arduino IDE softvera i metode brze izrade prototipova – 3D štampe. Robotska ruka opisana u ovom radu je jeftino i rešenje koje je studentima jednostavno za korišćenje. Na ovoj platformi studenti mogu usvojiti bazična znanja o mehanici sistema tela, kao i simulaciji kretanja i implementaciji na realnom modelu.

Ključne reči: industrijski robot, model robotske ruke, MATLAB, brza izrada prototipova.

Application of Computer Simulation in Engineering Education

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Abstract: Today it has become a widespread practice to use computer-based tools to enhance learning. Use of computer simulation in higher education is growing rapidly and has become a major trend in technical education because teaching of technical subjects is a very complicated and complex process and it is demand on logical thinking and imagination. This paper presents the application of interactive computer simulation tools Energy2D and Energy3D in the technical education process. Energy2D covers many topics in the science of heat transfer and its engineering applications. Energy-efficient building design challenges are used as the engineering examples to illustrate the learning and teaching opportunities created by the modelling, simulation, and data mining capabilities of the Energy3D software. The proposed application helps students to analyze and solve problems with relevant knowledge and enhance their practical abilities.

Keywords: computer simulation, technical education, 2D/3D simulations of heat energy, flow and solar radiation.

Primena računarske simulacije u inženjerskom obrazovanju

Rezime: Korišćenje računarskih alata danas je postala široko rasprostranjena praksa u cilju poboljšanja učenja. Korišćenje računarske simulacije u visokom obrazovanju brzo raste i postaje veliki trend u tehničkom obrazovanju jer je izvođenje tehničkih predmeta veoma komplikovan i složen proces i zahteva logičko razmišljanje i maštu. Ovaj rad predstavlja primenu interaktivnih računarskih simulacionih alata Energy2D i Energy3D u procesu tehničkog obrazovanja. Energy2D pokriva mnoge teme o prenosu toplote kao nauci i njegovim inženjerskim primenama. Kao inženjerski primeri koriste se izazovi projekata energetski efikasnih objekata koji ilustruju mogućnosti učenja i nastave stvorene modelima, simulacijama i sposobnostima za upravljanje podacima Energy3D softvera. Predložena aplikacija pomaže učenicima da analiziraju i rešavaju probleme sa relevantnim znanjem i poboljšavaju svoje praktične sposobnosti.

Ključne reči: računarske simulacije, tehničko obrazovanje, 2D/3D simulacije toplotne energije, strujanja i solarnog zračenja.

Design of 3D virtual classroom in Second Life for Metal cutting technology course

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Abstract: The paper describes possibility of using 3D virtual classroom in Metal cutting technology at the Technical College Čačak. The classroom is designed with aim to overcome common problems at laboratory classes, such as lack of time to work with real 3D models. Virtual worlds such as Second Life enable upgrading the reality and development of 3D models within virtual classroom. The 3D classroom will be used to allow students to access the high quality 3D models of cutting tools in virtual world at any time.

Keywords: 3D virtual classroom; 3D models; cutting tools; Second Life.

Kreiranje 3D virtuelne učionice u Second Life-u za predmet Tehnologija obrade

Rezime: Rad opisuje mogućnosti korišćenja 3D virtuelne učionice na predmetu Tehnologija obrade na Visokoj tehničkoj školi strukovnih studija u Čačku. Učionica je osmišljena sa ciljem da se prevaziđu standardni problemi u okviru laboratorijskih vežbi, kao što je nedostatak vremena za rad sa 3D modelima. Virtuelni svetovi kao što je Second Life omogućavaju visok stepen realističnosti i razvoj 3D modela u okviru virtuelne učionice. 3D učionica će biti korišćena tako da omogući studentima da pristupaju visoko kvalitetnim 3D modelima alata za obratu metala u virtuelnom svetu u bilo koje vreme.

Ključne reči: 3D virtualna učionica; 3D modeli; rezni alati; Second Life.

Numerical Analysis of the Profile in the Aero Tunnel

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Abstract: Contemporary product and process development involves the application of various software tools and technologies. The assessment of aerodynamic characteristics is an essential part of the optimal aero profile design process. This paper presents a numerical analysis of the aero tunnel profiles using Catia and Ansys Fluent software packages, and obtaining an effective method of determining the aerodynamic characteristics of the profile, which is based on viscous-non-viscous interaction. Ansys Fluent software package provides a wide range of tools for efficient application in the design of aero profiles, which reduces the time and cost of developing aero profiles compared to the classic approach to the development of physical models. The paper presents the graphs of the obtained values of the field velocities and pressures of the tested profile in a modeled aero tunnel with given boundary conditions. Special attention is devoted to monitoring the pressure changes and the air flow velocity at an object in the aero tunnel.

Keywords: aerodynamic; aero tunnel; modeling; numerical analysis.

Numerička analiza profila u aerotunelu

Rezime: Savremeni razvoj proizvoda i procesa podrazumeva primenu raznih softverskih alata i tehnologija. Procena aerodinamičkih karakteristika predstavlja suštinski deo procesa optimalne konstrukcije aeroprofila. U ovom radu je predstavljena numerička analiza profila u aerotunelu primenom softverskih paketa Catia i Ansys Fluent, i dobijanje efikasne metode određivanja aerodinamičkih karakteristika profila, koja je zasnovana na viskozno – neviskoznoj interakciji. Softverski paket Ansys Fluent daje širok spektar alata za efikasnu primenu u konstrukciji aeroprofila, što omogućava smanjenje vremena i troškova razvoja aeroprofila u odnosu na klasičan pristup izrade fizičkih modela. U radu su predstavljeni grafici dobijenih vrednosti polja brzina i polja pritisaka ispitivanog profila u modelovanom aerotunelu sa zadatim graničnim uslovima. Posebna pažnja je posvećena praćenju promene pritisaka i brzine strujanja vazduha na objektu u aerotunelu.

Ključne reči: aerodinamičnost, aerotunel, modeliranje, numerička analiza.

Health Care Analysis Using Statistics

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Abstract: In this paper, the data of a total of 215 patients with nine registered variables were processed. By applying appropriate statistical analysis, it has been found that variables within the groups do not have a normal distribution. Therefore, nonparametric analytical techniques were used. The results showed that the amount of consumed alcoholic beverages per day depends on the sex and that the mean value of the rank of this mark is higher in the male gender. Furthermore, tests have shown that marital status and the number of consumed caffeine drinks per day are dependent variable. The dependence of the marital status and the number of hours of sleep on weekends has been established. The paper also examines the correlation between some variables. The tests showed the existence of a negative correlation between the variables of the level of education and the number of cigarette smokers per day. The obtained results indicate that the level of education affects smoking behavior, which means that the prevention program should be the most intensive in the secondary school.

Keywords: statistics; health care; nonparametric techniques; hypothesis testing.

Analiza zdravstvene zaštite primenom statistike

Rezime: U ovom radu su obrađeni podaci uzorka obima 215 ispitanika na kojima su registrovane vrednosti devet varijabli. Primenom odgovarajućih statističkih analiza, utvrđeno je da promenljive u okviru grupa nemaju normalnu raspodelu. Stoga su korišćene neparametarske tehnike za analizu. Rezultati su pokazali da količina konzumiranog alkoholnih pića dnevno zavisi od pola i da je srednja vrednost ranga ovog obeležja veća kod muškog pola. Dalje, testiranja su pokazala da su bračno stanje i broj konzumiranih kofeinskih napitaka dnevno, zavisna obeležja. Ustanovljena je i zavisnost obeležja bračno stanje i broj sati sna vikendom. U radu je ispitivana i korelacija između nekih varijabli. Testovi su pokazali postojanje negativne korelacije između varijabli nivo obrazovanja i broj popušanih cigareta dnevno. Rezultati su pokazali da nivo obrazovanja utiče na pušačko ponašanje, što ukazuje na to da program prevencije treba da bude najintenzivniji u srednjoj školi.

Ključne reči: statistika; zdravstvena zaštita; neparametarske tehnike; testiranje hipoteza.

Student Attitudes about Cheating in High Education

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Abstract: This paper presents an attempt to obtain some insight into the phenomenon which all stakeholders in the process of education deal with. That phenomenon is definitely bad as for the acquisition of knowledge is concerned, but students from all over the world apply it through the process of their education. It is most pronounced in high education. Namely, we wanted to examine students what do they think about cheating in situations which cover several aspects of studying on high education institutions. A total number of 237 students from 11 study programs on four faculties were anonymously surveyed. Questionnaire with mostly closed questions was used for the survey. The results confirmed the situation which we are facing in the process of teaching – students do cheat. However, some of the results could be useful to professors to reduce the extent of cheating: (1) 40.08% of students ranked Pressure of high stakes test (one chance only) as the greatest reason to cheat; (2) 53.19% of students said that they would be less likely to cheat if the goal of a class is that they learn and master the material and they can retake if they haven't met that goal.

Keywords: survey; questionnaire; assessment scale; exam cheating; students.

Stavovi studenata u vezi varanja u visokom obrazovanju

Rezime: Ovaj rad predstavlja pokušaj da se stekne uvid u fenomen koji se tiče svih stejkholdera u procesu obrazovanja. Ova pojava je definitivno loša za sticanje znanja, ali je studenti iz celog sveta primenjuju tokom procesa njihovog obrazovanja. Najizraženija je u visokom obrazovanju. Naime, želeli smo da ispitamo učenike šta misle o varanju u situacijama koje pokrivaju nekoliko aspekata studiranja na visokoškolskim ustanovama. Anonimno je anketirano 237 učenika sa 11 studijskih programa na četiri fakulteta. Upitnik sa uglavnom zatvorenim pitanjima je korišćen za istraživanje. Rezultati su potvrdili situaciju sa kojom se suočavamo u procesu nastave, a to je da studenti varaju. Međutim, neki od rezultata mogu biti korisni za profesore da smanje obim varanja: (1) 40,08% studenata je rangiralo testove koji nemaju šansu za popravni kao najveći razlog za varanje; (2) 53,19% studenata reklo je da bi manje varali ako bi u okviru svake nastavne jedinice imali mogućnost da se testiraju da li su dobro razumeli gradivo.

Ključne reči: anketiranje; upitnik; skala procene; varanje na ispitu; studenti.

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