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IMPACTS OF ORGANIZATIONAL LEARNING CAPABILITY AND ISO 9001 EFFECTIVENESS ON FINANCIAL PERFORMANCE OF EXPORTING COMPANIES IN THE FEDERATION OF BOSNIA AND HERZEGOVINA

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Abstract

The main purpose of this study was to investigate the relationship between Organizational Learning Capability, ISO 9001 Effectiveness and Financial Performance of Bosnian exporters. Based on literature review, a conceptual model was validated and the hypotheses were proposed. The measurement instrument used in this study is a structured survey prepared based on literature review. The target population were the managers of Bosnian exporters that have the ISO 9001 standard implemented in the company. In total, 84 surveys were completed by respondents, which is sample good enough for the entity of the Federation of Bosnia and Herzegovina. Before conducting a regression analysis in Software Package for Social Sciences, the exploratory factor analysis was conducted and five items were extracted. The regression results indicated a strong and positive influence of ISO 9001 Effectiveness on Financial Performance and Organizational Learning Capability of Bosnian exporters. A positive relationship of Organizational Learning Capability and Financial Performance was not confirmed.

Keywords: *ISO 9001 Effectiveness, Organizational Learning Capability, Financial Performance*

IMPACTS OF ORGANIZATIONAL LEARNING CAPABILITY AND ISO 9001 EFFECTIVENESS ON FINANCIAL PERFORMANCE OF EXPORTING COMPANIES IN THE FEDERATION OF BOSNIA AND HERZEGOVINA

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Abstract

Human resources are the most important factor of quality at universities and in research. Therefore, universities must try to improve their human workforce quantitatively as well as qualitatively, by creating, attracting, and retaining experts at universities. The aim of this research is to evaluate the importance of the reward system as a factor of affective commitment and the effect of affective commitment on the organizational performance. The research was conducted in the universities located in the Central and Eastern Europe. In order to test the proposed hypotheses, exploratory factor analysis and mediation tests are applied, using 148 sample data from universities' academic and administration staff. The results indicate that organizational rewards play a significant role in influencing employees' attitudes related to improving the organizational performance. However, organizational performance is not influenced directly by organizational rewards, but through affective commitment. Organizational rewards are needed to increase the level of employees' commitment that will in return have a positive effect on employees' desire to contribute more to the organizational performance.

Keywords: *Extrinsic Rewards, Intrinsic Rewards, Affective Commitment, Human Resources Management, Organizational Performance*

EFFECTS OF ISO 9001 EFFECTIVENESS ON FINANCIAL PERFORMANCE OF EXPORTING COMPANIES: REVIEW AND A PROPOSED MODEL

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Abstract

The purpose of this study is to offer a conceptual model which is based on carefully reviewed literature. The model consists of three important variables: ISO 9001 Effectiveness, financial performance of exporting companies, and organizational learning capability. The model proposes direct impact of ISO 9001 Effectiveness on financial performance of companies which are exporting their products/services. However, the relationship between organizational learning capability and financial performance of exporting companies is included in the model. Moreover, mediating role of organizational learning capability is also considered in the model of this study.

Keywords: *Exporting Companies, ISO 9001 Effectiveness, Quality, Organizational Learning Capability, Financial Performance*

IMPACT OF CARING CLIMATE, JOB SATISFACTION, AND AFFECTIVE COMMITMENT ON EMPLOYEES' PERFORMANCE IN THE BANKING SECTOR OF BOSNIA AND HERZEGOVINA

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Abstract

The main purpose of this paper is to examine the impact of caring climate, employees' job satisfaction, and affective commitment on employees' job performance in a banking sector. This study proposes that caring climate has a significant direct effect on overall job satisfaction, affective commitment, and job performance. Moreover, it suggests that caring climate has an influence on job performance through overall job satisfaction and affective commitment. Additionally, affective commitment is considered to be a mediator in the relationship between overall job satisfaction and job performance. In this study, the relationships among the variables were evaluated using factor analysis, descriptive statistics, correlations, and regression. The results based on a sample of 152 employees from one public and three private banks in the Federation of Bosnia and Herzegovina support the hypotheses. This study demonstrates that caring climate has a significant direct influence on overall job satisfaction, affective commitment, and job performance. Furthermore, caring climate has an indirect effect on job performance. Finally, this research discovers an indirect relationship between overall job satisfaction and employees' job performance through a mediating role of affective commitment.

Keywords: *Affective Commitment, Bosnia and Herzegovina, Caring Climate, Job Satisfaction, Job Performance*

THE YOUTH'S PERCEPTION OF MIGRATION IN BOSNIA AND HERZEGOVINA

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Abstract

Migration, in a simple definition, is the movement of people from one country to another. One of the major problems in Bosnia and Herzegovina (BiH) is youth migration. Young people from BiH mostly migrate to European countries. Factors which have an influence on the youth migration and relationship between demographic differences, as well as the tendency of the youth to emigrate have attracted a great curiosity. The purpose of this study is to examine the perceptions of the youth about determinants of migration as well as the relationship between demographic variables and immigration tendency. Using the survey method, 207 responses were collected from the youth in BiH. Descriptive analysis, one-sample, and independent sample t-test were constructed to analyze data. The results have showed that the perceptions of the youth about job opportunities in BiH and approach of officials towards young people are negative. However, study results show that younger group of young people with less education have a greater tendency to emigrate.

Keywords: Migration, Bosnia and Herzegovina, The Youth

THE SIGNIFICANCE OF NON-MONETARY INCENTIVES AND ITS RELATIONSHIP WITH EMPLOYEE MOTIVATION: A CASE OF CIVIL SERVICE EMPLOYEES IN BOSNIA AND HERZEGOVINA

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Abstract

The purpose of this paper is to examine the perceived importance of non-monetary incentives as well as the degree of their current utilization within the civil service sector in Bosnia and Herzegovina. One of the aims of the study is to explore if non-monetary incentives have prospective to increase employee's motivation in comparison to monetary rewards. Such finding could play a beneficial role in understanding the fact that an individual's behaviour and motivation can be greatly influenced by alternative and cost-friendly non-financial motivating factors. The study is conducted on a sample of 129 civil servants of all categories at the state level. The relationships between the variables were evaluated by descriptive statistics, correlations and non-parametric independent samples test. The study findings demonstrate that the non-monetary incentives are not sufficiently utilized in the civil service sector. Furthermore, according to the findings, non-monetary incentives represent a very strong motivating factor and could be widely and actively used in order to secure increased motivation of the civil servants in Bosnia and Herzegovina.

Keywords: Non-monetary Incentives, Motivation, Civil Service, Monetary Incentives

ETHICAL CLIMATE, JOB SATISFACTION, AND AFFECTIVE COMMITMENT RELATIONSHIP IN THE SHOES MANUFACTURING SECTOR

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Abstract

Recent studies have demonstrated that retaining qualified employees is crucial for organizations. As labor-intensive sector, shoes manufacturing sector is highly dependent on qualified employees. Based on the literature in this field, affective commitment of employees to their organizations has a significant importance for retaining them. The main purpose of this study is to examine ethical climate, job satisfaction, and affective commitment relationship in the shoes manufacturing sector. A survey with four sections is conducted in 10 companies and 3 cities in Turkey with 161 respondents in overall. Descriptive and Pearson correlation analyses were made. The study results showed that statistically significant relationships exist among ethical climate, job satisfaction, and affective commitment. In specific, Law and Code type of ethical climate has a crucial statistically significant relationship with affective commitment.

Keywords: Ethical Climate, Job Satisfaction, Affective Commitment, Shoes Manufacturing Sector, Turkey

HOW DO ACCOUNTING PROFESSIONALS PERCEIVE WHISTLEBLOWING REASONS AND WHISTLEBLOWING PREFERENCES

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Abstract

Incidences of organizational wrongdoing have been widely spread throughout the business world. Accounting professionals are the key human resources who find evidence of wrongdoing in firms and have the opportunity to report it. The purpose of this study is to examine the relationship between the perception by accounting professionals concerning valid reasons for whistleblowing and their preferences in doing so. Using the survey method, 177 responses were collected from Turkish accounting professionals. A partial least square structural equation model was constructed to test both the reliability and validity of the measurement and the structural model. The results showed that the 'fear of retaliation' dimension has a significant negative influence on 'external whistleblowing' but has a positive influence on 'anonymous whistleblowing'. The accountants' perceptions of 'fear of retaliation' also has a positive relationship for deciding to not blow the whistle. However, the reasons for 'corporate benefit' whistleblowing have a positive effect on both 'anonymous whistleblowing' and 'internal whistleblowing'. They also have a negative impact on the reasons that accounting professionals prefer to not blow the whistle. Finally, the 'ethics and professional benefit' dimension of reasons for whistleblowing only has a significant positive impact on 'internal whistleblowing'.

Keywords: Whistleblowing Reasons, Whistleblowing, Accounting Professionals, Partial Least Square Structural Equation Model

ORGANIZATIONAL BEHAVIOR IN HIGHER EDUCATION (BOOK)

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Abstract

Today, both public and private universities need to provide students with extra opportunities on top of physical facilities so as to attract prospective students and retain and satisfy the current ones. In this regard, the discretionary and extra-role behavior of the academics and administrative staff, and the factors that can increase such behavior in public and private universities, have become vital. The role of the managers in each faculty and unit of these universities in influencing employees' extra efforts is important. Along with leadership, in particular ethical leadership, ethics and ethical climate, employees' job satisfaction and their commitment to the universities have attracted curiosity in terms of their impacts on the employees' citizenship behavior. This book examines several basic organizational behaviors in higher education: leadership, ethics, job satisfaction, organizational commitment, and organizational citizenship behavior. This book should help shed some light on higher education organizations by proposing a model and be especially useful to academics and administrative staff in universities.

FORENSIC ACCOUNTING AS A SOLUTION TO MANIPULATIVE ACCOUNTING OF SME'S IN BOSNIA AND HERZEGOVINA

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Abstract

Accounting reports are the main certificate of financial position, as well as the business and monetary success of the company. Manipulation of accounting reports includes fictitious or incorrect processing of data - all with the aim of camouflage the true picture of firm's financial health. Forensic accounting as a special accounting practice will be the scope of this study. This study was conducted on the Bosnian market and targeted small and medium enterprises with less than 250 employees. The aim of this research is to prove that forensic accounting gives satisfactory results in discovering significantly wrongly presented information in financial statements caused by fraud. This study uses primary data collection through the distribution of questionnaires. The data collected from the observed SMEs companies were analyzed, and study findings showed that forensic accounting is important and helpful to point out the wrongly presented information.

Keywords: *Forensic Accounting, Fraud Prevention, Small and Medium Enterprises, Manipulative Accounting*

BACKTESTING VALUE AT RISK FORECAST: THE CASE OF KUPIEC POF-TEST

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Abstract

In recent years many concepts for managing and measuring risk have developed. The main methodology for managing risk is a method of value at risk, which, in practice, is combined with other techniques for minimizing risks, in order to achieve optimal business results. Value at risk (VaR) is the biggest loss of the portfolio that can be expected in the reporting period, with a given level of confidence. This value is a simple, easily understandable number that presents the risk which the institution is exposed to on financial market. The principle of calculating capital is based on the VaR methodology. However, backtesting of calculated VaR amount is needed. Backtesting is the process where the real gains and losses are compared to the forecasted VaR estimates. The most used backtesting test is known as Kupiec POF test. The POF's null hypothesis, that the observed failure rate \hat{p} is equal to the failure rate suggested by the confidence interval, is being tested using the secondary data (daily share prices from <http://finance.yahoo.com>). The results from the test show that, at 90% and 99% level of confidence, null hypothesis is rejected and the model is considered as inaccurate.

Keywords: Value at risk, Back Testing, Confidence Interval, Risk Managements, POF test

USAGE OF DERIVATIVES IN EMERGING MARKETS: THE CASE OF BOSNIA AND HERZEGOVINA

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Abstract

During the last decade, financial derivatives have gained increased attention; they were one of the leading causes of the latest financial crisis. Their primary purpose is to provide instruments for hedging risks linked with stock market movements. Most of the financial economists agree that derivatives markets if abused, may cause disturbances in the financial markets, while some claim that derivatives markets provide valuable instruments for hedging financial risks. When we consider the importance of derivative markets, our primary goal is to investigate the degree of development of derivatives market in B&H. When we're talking about derivatives market in B&H, it does not exist as organized markets yet. As many derivatives are being offered to the firms, only within the banking sector, we concluded that the financial system in B&H is bank centered. It follows the Continental model in which banks are playing a leading role. The participation of banks in the case of B&H is over 80%. The financial derivative market is organized as over the counter market as it offers currency swaps and forwards, and interest rate forwards. It's important to notice that almost all business operations are done in "euro." Because of the currency board regime, agency regulations on banks' net open position and a relatively small exposure to foreign currencies, except the euro, currency risk in B&H is small. However, risk management is important for every firm, so the primary focus of this paper will be how B&H nonfinancial companies manage the risks that they have regarding the use of financial derivatives.

Keywords: Financial derivatives, Financial system, Risk management, Emerging markets, Volatility

BEHAVIORAL ECONOMICS PERSPECTIVE ON FOREIGN DIRECT INVESTMENT IN EMERGING MARKETS: THE CASE ON BOSNIA AND HERZEGOVINA

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Abstract

The growing field of behavioral economics (BE) has revolutionized the way we look at economic behavior at micro and macro levels. Importance of foreign direct investment (FDI) appeals for analysis of decisions made regarding it to be assessed from expanding view of BE. This research provides overview of previous studies and focuses on the case of Bosnia and Herzegovina (B&H) as representative of emerging markets to investigate motivations for investing into this country by temporarily present foreign companies. Empirical analysis was based on the questionnaire that was disseminated among foreign investors to B&H. Questionnaire contained motivations for investing in B&H, where examined motivation factors were divided in two groups; namely irrational and rational ones. Choice of methodology was narrowed due to moderate sample size, but consisting of quality the sample members. In order to analyze data, descriptive statistics, correlation analysis and regression analysis were used. By regressing two groups of predictors on annual amount of foreign investments to B&H, it was shown that the highest motivation for investing was business instinct.

Keywords: Behavioral Economics, Foreign Direct Investments, Emerging Markets, Emotional Bias

A RESEARCH REVIEW OF MOTIVATION-ENHANCING OF HUMAN RESOURCE PRACTICES

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Abstract

This analysis of 115 articles about motivation-enhancing human resource practices published in seven Human Resource Management journals in a period between 2010 and 2015 presents significant contributions of individual scholars and institutions to research of motivation-enhancing human resource practices. Coauthor relationship is found through network analysis in order to show interrelationship among scholars who have contributed to this research. However, in order to provide main categories and subcategories in the field, authors carried out content analysis of the articles. Moreover, research locations, and methodologies of the articles are analyzed. Finally, to demonstrate recent trend of the research of motivation-enhancing human resource practices in the aforementioned period, this study provides some essential information such as number of articles published in each journal and in each year.

Keywords: *Research of motivation-enhancing human resource practices, Human resource practices, Research topic, Research location, Research methodology, Scholar network*

HUMAN CAPITAL AND ECONOMIC DEVELOPMENT REVIEW OF WHAT WAS STUDIED AND WHERE WAS RESEARCHED

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Abstract

The main aim of this study is to define the most researched topics and geographical locations and the most active authors and institutions in Human Capital and Economic Development research area. 317 articles that published between 2007 and 2014 from 5 different journals with Social Scientific Citation Index (SSCI) were examined. This study also explores relation between research topics and researched countries and why some topics attracted more attention than others. It is found that some topics and geographic locations were researched more than others. Authors identified topics that were researched less or not researched as well as geographic locations. Proposal for future study is discussed according to results of analysis.

Keywords: *Human Capital, Economic Development, Research Topics, Research Geographical Location*

SISTEM PREVENCIJE MALOLJETNIČKOG PRESTUPNIŠTVA I KRIVIČNO- PRAVNIH MJERA ZA MALOLJETNE IZVRŠIOCE KRIVIČNIH DJELA U ČESKOJ REPUBLICI

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Abstract

Sudstvo za maloljetnike je izuzetno osjetljiva grana krivičnog prava koja zahtijeva pažljiv pristup u pronalaženju adekvatnih rješenja za posebne potrebe maloljetnika u sukobu sa zakonom. Procesno postupanje prema maloljetnim izvršiocima krivičnih djela u Češkoj Republici je regulisano Zakonom o sudstvu za maloljetnike br. 218/2003 Sb[1]. (na češkom: Zakon o soudnictví ve věcech mládeže ZSM). Ovaj Zakon stavlja naglasak na vaspitno-odgojne mjere u odnosu na krivične sankcije za punoljetne osobe. Kao preventivne mjere u sudskoj praksi Češke Republike javljaju se mjere u krugu porodice, mjere u krugu vaspitno-odgojnih institucija, mjere prilagođavanja, te mjere protiv nasilničkog ponašanja i dr. Cilj ovog članka je prikaz strukture i načina primjene ZSM-a u Češkoj Republici, te pregled njegovih osnovnih instituta. U nastavku slijedi kratki prikaz razvoja ovog zakona, te analiza različitih krivičnopravnih mjera koje se odnose na maloljetne izvršioce krivičnih djela u ČR.

**PRAVOSUDNI AKTIVIZAM U PRAKSI EVROPSKOG SUDA PRAVDE I UTICAJ
NA SUVERENITET DRŽAVA ČLANICA EU, PRAVNA MISAO, FEDERALNO
MINISTARSTVO PRAVDE - LEGAL THOUGHT 1-2/16, FEDERAL MINISTRY OF
JUSTICE, SARAJEVO**

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Abstract

Evropska je unija, kao jedinstvena „supranacionalna“ pravno-politička organizacija, vremenom oblikovala svoju formu kroz postepeni prijenos suverene vlasti država članica na institucije saveza, što je u konačnici rezultiralo stvaranjem jedinstvenog pravnog sistema. Pravosudni aktivizam Suda pravde Evropske Unije je izuzetno značajno uticao na neposredno oblikovanje pravnog poretka Unije, prvenstveno putem tumačenja i primjene temeljnih Ugovora, ali i stvaranjem zasebnih pravnih normi.

Cilj ovog članka je analiza sistema funkcionisanja pravnog sistema Evropske unije, s posebnim osvrtom na definisanje, razgraničavanje i poimanje nacionalnog suvereniteta država članica EU, a kroz prizmu pravosudnog aktivizma Suda pravde EU. Analizom prakse Suda pravde Evropske unije, nastojat ću prikazati kako je ista uticala na promjene i poimanje u pogledu suvereniteta država članica. Uz osvrt na brojne ključne presude koje se odnose na slučajeve diskriminacije i zaštite ljudskih prava, nastojat će se dati odgovor na pitanja kako i koji su predmeti pred ESP imali ključni uticaj, ne samo na razvoj unijskog prava, već i na proces evropske integracije uopće.

LEGAL AND HISTORICAL ANALYSIS OF THE HOLOCAUST IN THE VISEGRAD (V4) COUNTRIES (BOOK)

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Abstract

The edited volume examines the history of the Holocaust within a multi-contextual legal comparative approach in the Visegrad countries: Czech Republic, Hungary, Slovakia, and Poland. The chapters focus on overarching issues and interpretations of the Holocaust, the fate of Jewish and non-Jewish victims during the Nazi era, in each of the V4 countries, as well as various features of the Holocaust in different temporal and geographical contexts of the V4 countries. The volume was edited by Hasic Jasmin, Memisevic Ehlimana, and Karcic Hikmet.

DUAL CITIZENSHIP AND YOUTH IDENTITY IN BOSNIA AND HERZEGOVINA (CHAPTER IN BOOK)

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Abstract

This chapter contributes to both citizenship and diaspora studies by examining the ways in which dual citizenship impacts young people living in Bosnia and the diaspora. We find that dual citizenship acts as a safety net for Bosnian youth living in the country. Some young Bosnians conceptualize dual citizenship as a safety net because 'duals' can relocate if the economy worsens or if the country slips back into conflict. This safety net has implications for how youth with or without dual citizenship perceive their relationship to the future of their country.

**THE INFLUENCES OF DAYTON AGREEMENT ON INSTITUTIONS:
LEGISLATURES IN BOSNIA AND HERZEGOVINA (CHAPTER IN BOOK)**

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Abstract

The aim of this chapter is to provide the overview of the state legislature as it has been established by the Annex IV (the Constitution) of the Dayton Agreement, through the brief analysis of its structure, functions, organization, and relationship to other branches of government and relevant stakeholders. We will also briefly consider the attempts at a parliamentary reform, before concluding.

ETHNIC MOBILIZATION, VIOLENCE AND THE POLITICS OF AFFECT: SERB DEMOCRATIC PARTY AND THE BOSNIAN WAR (BOOK)

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Abstract

This book offers an unprecedented account of the Serb Democratic Party's origins and its political machinations that culminated in Europe's bloodiest conflict since World War II. Within the first two years of its existence, the nationalist movement led by the infamous genocide convict Radovan Karadzic, radically transformed Bosnian society. It politically homogenized Serbs of Bosnia-Herzegovina, mobilized them for the Bosnian War, and violently carved out a new geopolitical unit, known today as Republika Srpska. Through innovative and in-depth analysis of the Party's discourse that makes use of the recent literature on affective cognition, the book argues that the movement's production of existential fears, nationalist pride, and animosities towards non-Serbs were crucial for creating Serbs as a palpable group primed for violence. By exposing this nationalist agency, the book challenges a commonplace image of ethnic conflicts as clashes of long-standing ethnic nations.

A COMPARATIVE STUDY ON CREDIT RISK ASSESMENT OF ENTERPRISES IN TURKEY

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Abstract

Credit risk prediction models attempt to predict whether a business will experience to be in a level of investment, speculative or below investment. The purpose of this paper is to propose an alternative model for predicting failure. The constructed credit rating model was on a sample data that consists of financial ratios from 356 enterprises that are listed on the Istanbul Stock Exchange. The data covers observations running from the first quarter of 2014 to the end of year. We have classified 356 enterprises into three levels using 18 parameters for each. The applied methods are discriminant analysis and Adaptive Neuro Fuzzy Inference Systems (ANFIS). The study supports building a balanced financial environment and help to determine the firms which are appropriate for credit loan.

Keywords: ANFIS, Credit Risk Assessment, Discriminant Analysis, Financial Ratios

THE INFLUENCE OF NATURAL CAPITAL ON DEVELOPMENT OF RURAL AREAS

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Abstract

The characteristics of rural areas in Bosnia and Herzegovina are similar to the ones in other countries but are also specific in relation to the overall country development, natural resources and mentality of the people (social and human capital). The aim of the study is to evaluate the influence of availability and effective usage of natural resources and development of rural areas. This study represents a cross-sectional study which used both quantitative and qualitative methodology. Target population were entrepreneurs, artisans and representatives of organisations for civil society in municipalities classified as rural. In total, more than five hundred questionnaires were used in the analysis. The results showed that natural capital has statistically significant influence on development of rural areas. However, that influence is negative which confronts majority number of available literature. This research could present, along with other studies and sector analysis, useful base for constructive discussions on direct and long lasting measurements for improving rural development in our country in consistent, systematic and strategic way.

Keywords: Rural Development, Natural Capital, Municipalities, Bosnia and Herzegovina

EXPLORING ISLAMIC INDICES IN THE GREAT RECESSION (CHAPTER IN BOOK)

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Abstract

Interest towards Islamic Finance has grown rapidly since the 1990s and assets invested in portfolios that are consistent with Islam have increased abruptly as a result of the deep need to invest in alternative conventional portfolios. The motivation of Muslim investors to participate in these funds has resulted in the inception of Islamic Indices. As such, several such indices have been launched in the last two decades including the Dow Jones, FTSE, MSCI and Thomson Reuters Islamic Indices. Although the Islamic Indices are more than two decades old, studies conducted on them are very limited, especially when compared to conventional ones. In this study, we intend to explore the success of three popular Value-at-Risk methods, namely GARCH (1,1)-t, Extreme Value Theory (EVT) and Filtered Historical Simulation (FHS) using the Islamic Indices of 20 Developed and 18 Emerging countries. In all these analyses we include the non-Islamic counterpart index for a benchmark comparison. We backtest the VaR figures with the unconditional Kupiec Test and conditional Christoffersen Test to check the performance of the VaR calculations. We use the MSCI indices of daily returns from June 2008 to August 2014 in order to explore the performance of these Value-at-Risk methods after the global financial crisis with the intention of documenting the positive and negative effects of the great recession.

Keywords: *Islamic Indices, Conventional Indices, Global Financial Crisis, Value-at-Risk, Kupiec Test, Backtesting.*

OPTIMAL CONTROL OF THE MACROECONOMY WITH THE APPLICATION TO 2001 CRISIS OF TURKEY

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Abstract

This paper concentrates on the application of optimal control theory to highlight some aspects of Turkish economy. First the setup is given for Turkey to grow over the balanced path. Then the optimal control problem is identified. The control and state variables are mentioned. The objective is the maximization of life-time discounted utility of the society through optimal choice of consumption which automatically determines investment. We make use of Bellman's principle to guarantee optimality. We make necessary assumptions (technical assumptions) to make use of calculus techniques for a solution. Some functions to represent utility and production are specified. I used the econometric techniques to estimate some parameters of the functions to decide upon the optimal level of investment for steady-state in Turkey over the period including 2001 crisis. The corresponding differential equations are obtained as a result of the Hamiltonian defined. The phase diagram is prepared to analyse different trajectories.

Keywords: Optimal Control, Growth, Turkey, CRRA, Cobb-Douglas

EFFECT OF GOVERNMENT EXPENDITURE ON GDP IN THE TURKISH ECONOMY

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Abstract

The objective of this article is to investigate the effect of government expenditure on GDP in Turkey from 2000Q1-2015Q4 by the superexogeneity test. As a consequence of satisfying both conditions of weak exogeneity and structural invariance, government expenditure is super exogenous to GDP which implies that the policy regime shift for the period of the Global Financial Crisis in Turkey did not cause structural variance in government expenditure. Indeed, the Lucas Critique which indicates that policy regime shifts cause structural breaks, appears to be refuted.

Keywords: *Lucas Critique, Government Expenditure, Superexogeneity Test*

THE IMPACT OF EWOM IN SOCIAL MEDIA ON CONSUMER PURCHASE DECISIONS

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Abstract

Marketers define their social media platform as an essential piece to reach their consumers. The flock of web users turning to social media to receive and convey their thoughts, opinions, and suggestions has made social media an integral part of digital marketing. Using traditional media to advertise had restrictions in placement and outcome while, nowadays, social media has liberated this obstacle. It has created a platform which allows information to spread freely and at a fast pace. Using electronic word-of-mouth in social media permits a constant connection to a vast audience. The purpose of this study is to explore the effect of electronic word-of-mouth within the context of social media on consumer purchase decisions. More precisely, how the familiarity of the eWOM source, the way of communication, writer's expertise and the popularity of a product affects the consumer's purchase decision. The data has been gathered using quantitative research method. The sample consists of students studying in Timisoara, Romania. The surveys were e-mailed to students' e-mail addresses. Due to the lack of response from e-mails, the responses were gathered using a mixture of door-to-door and online surveys methods. The questions were answered by 200 students within a month. The results will provide the extent of impact eWOM in social media has on the purchase decisions.

Keywords: *Electronic word-of-mouth, Social media, Digital marketing, Purchase decision*

STUDY ON CLIENT - SATISFACTION FACTORS IN CONSTRUCTION INDUSTRY, EUROPEAN

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Abstract

Client satisfaction represents a crucial factor in the development and management of the construction process, as well in the creation of professional company-client relationships. Moreover, it is one of the major determinants of project success and therefore is a fundamental issue for construction managers who must constantly seek to improve their performance in order to survive in the marketplace. Providing superior quality and keeping customers satisfied are rapidly becoming the ways that companies use to differentiate themselves from competitors. The main objective of this study is to establish a comprehensive list of factors used for measuring client satisfaction and to study their influence on client satisfaction in the construction industry. The purpose of this study is to identify main client satisfaction factors and to advance both theoretical and practical understanding of their satisfaction in construction industry. A survey conducted in this study was focused on clients of different companies from construction industry in Bosnia and Herzegovina (B&H). The perceptions of clients with respect to the performance of contractors were measured using five factors including timeliness, cost, quality, client orientation and safety. Through the analysis of data generated by the survey, it is concluded that all the factors identified in the client-satisfaction model do not possess the same significance when it comes to satisfying clients. The approach of this research is useful to construction firms, not only in B&H, but also in other places, for identifying and improving their weak areas and improving the service quality for their clients.

Keywords: Client Satisfaction, Satisfaction Factors, Construction Industry, Bosnia & Herzegovina

WIN – WIN FACTORS OF HIGH-END PERFUME PACKAGING THAT LEAD TO PURCHASE DECISION

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Abstract

This research will provide specific data that will aid in explaining how different factors of high-end perfume packaging impact consumer buying behavior. Thus, the basic purpose of this it is to find out how such factors are behind the success of packaging. It has been observed that perfume packaging elements such as color, wrapper design, packaging material, font style and innovative ideas have significant impact on consumers' buying behavior. In this research we will find out the relationship between independent variable and dependent variables. The research is based in Federation of Bosnia and Herzegovina. The primary data for this research was gathered in the form of survey. Data analysis was conducted in SPSS software. Statistical tests were run to ensure that results are usable in resolving the main perfume packaging factors customers are impacted by.

Keywords: *Color, Innovation, Customer Preference, Design, Information Specified, Materials Used, High-end, Fragrance, Perfume, Scent*

EFFECTS OF SOCIAL MEDIA COMMUNICATION ON BRAND EQUITY AND BRAND PURCHASE INTENTION: A CASE STUDY ON DOMESTIC BRANDS IN BOSNIA AND HERZEGOVINA

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Abstract

Social media is forming an increasingly central part of how companies communicate their marketing strategies to their customers. Online communities carry a strong and influential voice, and there is much to be gained from engaging directly with people through these channels – whether it is reaching and keeping existing customers or acquiring new ones. In light of such positive ground for social media this study aims to provide an empirical analysis of the impact social media communication has on brand equity and purchase intention. A systematic literature review has been conducted in order to understand how the dimensions of social media create word of mouth i.e. electronic word of mouth (E-WOM) on social media platforms and how this E-WOM further influences brand equity and customers' purchase intention of domestic brands in Bosnia and Herzegovina. 300 data sets were generated through a standardized online-survey and analyzed in SPSS. The results of the empirical study showed that both firm-created and user-generated social media communication influence brand equity, consequently impacting brand purchase intention.

Keywords: *Social Media Communication, E-WOM, Brand Equity, Purchase Intention, Bosnia and Herzegovina*

THE ROLE OF AFFECTIVE FACTORS ON BRAND RESONANCE: MEASURING CUSTOMER - BASED BRAND EQUITY FOR THE SARAJEVO BRAND

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Abstract

The purpose of this paper is to analyze the role of affective factors on brand resonance in the context of a destination brand. Keller's brand resonance model (Keller, 2013) was used to identify the role of affective factors in the brand equity chain. The research was conducted on the 'Sarajevo' brand, with an expectation that affective factors would be more influential on brand resonance than cognitive factors. Sarajevo is remembered as the center of the war that resulted in the collapse of the Republic of Yugoslavia in 1990s and emotions towards the suffering of civilians under siege are still dominant. The research hypothesis was tested with data from 286 Turkish visitors. A Turkish sample was chosen to test the hypothesis due to the fact that Turkish and Bosnian populations have strong historical ties with each other and Sarajevo represents an emotionally strong destination for Turkish population. Results from multiple regression analysis indicate that the central hypothesis is valid and tourist resonance perceptions on Sarajevo brand are stronger on the affective route than cognitive route. Model constructs were also analyzed descriptively with data from a second sample of visitors from more than 45 countries (N = 193), where it was found that city's affective image was evaluated more strongly than its cognitive image. These findings together are used to propose strategies for Sarajevo marketers, out of which using the emotional aspects of the city in destination marketing seems to be the most influential.

DETECTION OF FINANCIAL STATEMENT FRAUD USING BENEISH MODEL

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Abstract

One of the greatest challenges faced by auditors is to detect anomalies in financial statement reporting. Once the anomalies are detected they have to be further investigated by forensic accountants. However, the practice of forensic accounting has not yet become a reality in Bosnia and Herzegovina. So the main purpose of the study is to analyze to which degree BH companies are exposed to the financial statement fraud and with respect to that the need for forensic accountants. The financial statement data will be collected from BH companies and it will be analyzed using Beneish model. The Beneish model is the mathematical model that identifies the manipulation of earnings through financial ratios. These analytical techniques should reveal the unconventional variations in financial statement reporting, indicating that there is possibility of fraudulent transactions.

Keywords: *Beneish model, Fraudulent Reporting, Forensic Accounting*

MEASURING QUALITY OF SERVICES AT HEI: CASE OF PRIVATE UNIVERSITY IN B&H

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Abstract

The main purpose of this study is to investigate quality level of higher education institution's (HEI) services through students' perceptions, and to conduct cross years' comparative analysis. Main instrument for this study is a survey with several dimensions dealing with different aspects of higher education: quality in general, quality of academic staff, quality of administrative staff, quality of campus, quality of study programs, quality of services, personal development support, education facilities and cafeteria. Software used in the study is Microsoft Excel. In total, 440 responses were collected which represents almost 50% of population. Cross years comparative analysis indicated tremendous increase in all indicators after institution has implemented HEA standards and went through successful accreditation process. Recommendations for corrective/preventive measures will be given wherever necessary. Results of the analysis show that students's rating of university services on the level of university have mean of 5,1 which indicates that students are slightly satisfied with the services of university overall.

Keywords: HEI, University, Quality, Comparative Analysis

COMPARATIVE ANALYSIS OF IMPLEMENTING ISO 9001:2015 STANDARD AND ESG 2015

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Abstract

Significant revisions of quality standards ISO 9001:2015 and European Standards and Guidelines have been completed in year 2015. Due to compatibility of mentioned standards, many higher education institutions (HEIs) which operate in European Higher Education Area (EHEA) implement quality management system (QMS) aligned with requirements of previous versions of ISO 9001:2008 and ESG 2005. As ISO 9001:2015 i ESG 2015 are adopted recently, most probably there are no many institutions that aligned their QMS with new requirements. Aim of this article is to answer following question: What are the consequences and compatibility level of implementing ISO 9001:2015 and ESG 2015?

Keywords: Standard, Quality Management System (QMS), ISO 9001:2015; ESG 2015, Higher Education Institutions

DIASPORAS AND TRANSITIONAL JUSTICE: TRANSNATIONAL ACTIVISM TO BUILD A MEMORIAL AT THE OMARSKA CONCENTRATION CAMP IN BOSNIA-HERZEGOVINA

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Abstract

Scholarships on transitional justice, transnational social movements and transnational diaspora mobilization have offered little understanding of how memorialization initiatives with significant diaspora involvement emerge transnational and are embedded and sustained in different contexts. We argue that diasporas play a galvanizing role in transnational interest-based and symbolic politics, expanding claim-making from local to national, supranational, and global levels of engagement. Using initiatives to commemorate atrocities committed at the former Omarska concentration camp in Bosnia and Herzegovina, we identify a four-stage mobilization process. First, initiatives emerged and spread across transnational networks after a local political opportunity opened in the homeland. Second, attempts at coordination of activities took place transnational through an NGO. Third, initiatives were contextualized on the nation-state level in different host-states, depending on the political opportunities and constraints available there. Fourth, memorialization claims were eventually shifted from national to supranational and global levels. The article concludes by demonstrating the potential to apply the analysis to similar global movements in which diasporas are directly involved.

AIMING FOR TRANSITIONAL JUSTICE: DIASPORA MOBILIZATION TOWARDS YOUTH AND EDUCATION IN BOSNIA AND HERZEGOVINA

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Abstract

*Education is acknowledged as a component of transitional justice processes, yet details about how to implement education reform in postconflict societies are underexplored and politicized [King, Elisabeth. 2014. *From Classrooms to Conflict in Rwanda*. New York: Cambridge University Press]. Local and international actors often neglect the complicated nature of education reform in postconflict societies undergoing transitional justice processes [Jones, Briony. 2015. "Educating Citizens in Bosnia-Herzegovina: Experiences and Contradictions in Post-war Education Reform." In *Transitional Justice and Reconciliation: Lessons from the Balkans*, edited by Martina Fischer, and Olivera Simic, 193–208. New York: Routledge. *Transitional Justice*]. The role of the diaspora in transitional justice has been increasingly explored as a participatory transnational actor with influence and knowledge about local dynamics [Roht-Arriaza, Naomi. 2006. *The Pinochet Effect: Transnational Justice in the Age of Human Rights*. Philadelphia: University of Pennsylvania Press; Haider, Huma. 2008. "(Re)Imagining Coexistence: Striving for Sustainable Return, Reintegration and Reconciliation in Bosnia and Herzegovina." *International Journal of Transitional Justice* 3 (1): 91–113; Young, Laura, and Rosalyn Park. 2009. "Engaging Diasporas in Truth Commissions: Lessons from the Liberia Truth and Reconciliation Commission Diaspora Project." *International Journal of Transitional Justice* 3 (3): 341–361; Koinova, Maria, and Dženeta Karabegović. 2017. "Diasporas and Transitional Justice: Transnational Activism from Local to Global Levels of Engagement." *Global Networks* 17 (2): 212–233]. This article bridges academic literature about diaspora engagement and transitional justice, and education and transitional justice by incorporating the role of diaspora actors in post-conflict processes. Using empirical data from multi-sited field work in Bosnia and Herzegovina, Switzerland, Sweden, the United Kingdom, and France, it examines diaspora initiatives which aim to influence local transitional justice processes through translocal community involvement in education and youth policy. It argues that diaspora initiatives can provide alternative and intermediate solutions to the status quo in their homeland, with some potential for contributing to transitional justice and reconciliation processes.*

Ultimately, diaspora initiatives need support from homeland institutions in order to forward transitional justice agendas in post-conflict societies.

Keywords: *Diaspora, Transitional Justice, Education, Youth, Bosnia and Herzegovina*

II PART: Faculty of Engineering and Natural Sciences

CLOUD COMPUTING THREATS CLASSIFICATION MODEL BASED ON THE DETECTION FEASIBILITY OF MACHINE LEARNING ALGORITHMS

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Abstract

Cloud computing became very popular in past few years, and most of the business and home users rely on its services. Because of its wide usage, cloud computing services became a common target of different cyber-attacks executed by insiders and outsiders. Therefore, cloud computing vendors and providers need to implement strong information security protection mechanisms on their cloud infrastructures. One approach that has been taken for successful threat detection that will lead to the successful attack prevention in cloud computing infrastructures is the application of machine learning algorithms. To understand how machine learning algorithms can be applied for cloud computing threat detection, we propose the cloud computing threat classification model based on the feasibility of machine learning algorithms to detect them. In this paper, we addressed three different criteria types, where we considered three types of classification: a) type of learning algorithm, b) input features and c) cloud computing level. Results proposed in this paper can contribute to further studies in the field of cloud threat detection with machine learning algorithms. More specifically, it will help in selecting appropriate input features, or machine learning algorithms, to obtain higher classification accuracy.

Keywords: *Cloud computing, Machine learning algorithms, Computational modeling, Telecommunication traffic, Computer crime, Support vector machines*

SMART HOMES WITH VOICE ACTIVATED SYSTEMS FOR DISABLED PEOPLE

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Abstract

Smart home refers to the application of various technologies to semi-supervised home control. It refers to systems that control temperature, lighting, door locks, windows and many other appliances. The aim of this study was to design a system that will use existing technology to showcase how it can benefit people with disabilities. This work uses only off-the-shelf products (smart home devices and controllers), speech recognition technology, open-source code libraries. The Voice Activated Smart Home application was developed to demonstrate online grocery shopping and home control using voice commands and tested by measuring its effectiveness in performing tasks as well as its efficiency in recognizing user speech input.

Keywords: *Voice Activated Smart Home, Voice controller, Helping people with disabilities*

CLASSIFICATION OF ON-OFF STATES OF APPLIANCE CONSUMPTION SIGNATURES

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Abstract

Nonintrusive load monitoring (NILM) is a procedure for the analysis of the changes in the power (current and voltage) that goes into households and classifying the appliances used in the house according to their individual energy consumption. Utility companies use smart electric meters accompanied with NILM to examine the particular uses of electric power in households. Focus of this paper is on the analysis of the “ACS-F2 Database of Appliance Consumption Signatures”. The challenge lies in predicting the states of the electrical devices based on the measuring data which had been previously stored. Machine learning techniques have demonstrated to be effective in classification and pattern recognition tasks. In this paper, different algorithms implemented in the WEKA software are going to be used for the classification.

Keywords: Home appliances, Databases, Training, Classification algorithms, Monitoring, Vegetation, Algorithm design and analysis

AN INNOVATIVE RFID-BASED SOLUTION TO SECURE PARKING SPOTS FOR PHYSICALLY CHALLENGED

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Abstract

Using RFID Technology is increasingly integrated in our daily life. We are presenting in this paper the secured parking spots for physically challenged “SPSPC” system implementing the RFID technology for managing parking slots of physically challenged. We demonstrated using scenarios (car with tag, car with expired date tag, car without tag) that the ‘SPSPC’ system is able to recognize not only cars equipped with tag -then send accordingly welcoming SMS -but also cars without tags by checking with a step tag fixed in the wall. Operational mode of the ‘SPSPC’ system is illustrated as well as main components, methods, snippets of code and interfaces are presented and commented. In addition, we demonstrated how the ‘SPSPC’ system is providing the tracking of people committing repetitively these violations -by reporting them to the authorities- and generating statistics on parking occupancy rates helping in providing sufficient slots.

Keywords: RFID Technology, Parking management, System design

REMAINING LIFETIME MODELING USING STATE-OF-HEALTH ESTIMATION

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Abstract

Technical systems and system's components undergo gradual degradation over time. Continuous degradation occurred in system is reflected in decreased system's reliability and unavoidably lead to a system failure. Therefore, continuous evaluation of State-of-Health (SoH) is inevitable to provide at least predefined lifetime of the system defined by manufacturer, or even better, to extend the lifetime given by manufacturer. However, precondition for lifetime extension is accurate estimation of SoH as well as the estimation and prediction of Remaining Useful Lifetime (RUL). For this purpose, lifetime models describing the relation between system/component degradation and consumed lifetime have to be established. In this contribution modeling and selection of suitable lifetime models from database based on current SoH conditions are discussed.

Main contribution of this paper is the development of new modeling strategies capable to describe complex relations between measurable system variables, related system degradation, and RUL. Two approaches with accompanying advantages and disadvantages are introduced and compared. Both approaches are capable to model stochastic aging processes of a system by simultaneous adaption of RUL models to current SoH. The first approach requires a priori knowledge about aging processes in the system and accurate estimation of SoH. An estimation of SoH here is conditioned by tracking actual accumulated damage into the system, so that particular model parameters are defined according to a priori known assumptions about system's aging. Prediction accuracy in this case is highly dependent on accurate estimation of SoH but includes high number of degrees of freedom. The second approach in this contribution does not require a priori knowledge about system's aging as particular model parameters are defined in accordance to multi-objective optimization procedure. Prediction accuracy of this model does not highly depend on estimated SoH. This model has lower degrees of freedom.

Both approaches rely on previously developed lifetime models each of them corresponding to predefined SoH. Concerning first approach, model selection is aided by state-machine-based algorithm.

In the second approach, model selection conditioned by tracking an exceedance of predefined thresholds is concerned. The approach is applied to data generated from tribological systems. By calculating Root Squared Error (RSE), Mean Squared Error (MSE), and Absolute Error (ABE) the accuracy of proposed models/approaches is discussed along with related advantages and disadvantages. Verification of the approach is done using cross-fold validation, exchanging training and test data. It can be stated that the newly introduced approach based on data (denoted as data-based or data-driven) parametric models can be easily established providing detailed information about remaining useful/consumed lifetime valid for systems with constant load but stochastically occurred damage.

Keywords: *Structural health monitoring, Wear aging, Prognosis, Feature extraction, State classification, Remaining lifetime modeling, Condition-based maintenance*

STRUCTURAL HEALTH MANAGEMENT UTILIZATION FOR LIFETIME PROGNOSIS AND ADVANCED CONTROL STRATEGY DEPLOYMENT OF WIND TURBINES: AN OVERVIEW AND OUTLOOK CONCERNING ACTUAL METHODS, TOOLS, AND OBTAINED RESULTS

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Abstract

In this contribution, Structural Health Monitoring (SHM) systems applied to wind turbines (WTs) are considered. Challenges resulting from contradictions between requirements related to efficient operation with respect to energy production costs and those related to lifetime and maintenance are discussed. Especially pronounced in larger WT systems, structural loads contribute to lifetime shortening due to damage accumulation and damage-caused effects influencing subsystems of the wind turbine. Continuous monitoring of the WT system concerning State-of-Health is necessitated to provide information about the condition of the system guaranteeing reliable and efficient operation, as well as efficient energy extraction. In recent years, structural health monitoring of WT systems is significantly improved through automated on-line fault detection and health or condition monitoring (CM) system integration. In this contribution the focus is given to hardware components (mainly sensor technologies) and methods used for change evaluation, damage detection, and damage accumulation estimation. Accordingly, this contribution comprises recent knowledge about methods and approaches of handling structural loads with emphasis on offshore wind turbine systems and applied sensing technologies (especially with respect to wind turbine blades, gearboxes, and bearings) and partly hardware. Moreover, a brief sketch of an advanced concept is developed concerning structural load examination affected by operating conditions. Key idea of the introduced approach is to use the operating conditions to control and especially to extend system's lifetime. The review presents an actual state-of-the-art and overview related to the use and application of SHM-related technologies and methods. Especially in combination with the briefly introduced lifetime extension concept, the

contribution gives comprehensive and detailed overview in combination with an outlook to upcoming technological options.

Keywords: *Structural health monitoring, Wind turbine diagnosis, Prognosis, Lifetime control, Home limp modes*

IMPLEMENTATION OF FREQUENCY-BASED CLASSIFICATION OF DAMAGES IN COMPOSITES USING REAL-TIME FPGA-BASED HARDWARE FRAMEWORK. IN PROCEEDING OF ASME

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Abstract

Structural Health Monitoring (SHM) systems become an integral part of most technical systems in recent years. An integration of SHM in technical systems is closely related to: i) providing the guaranteed service lifetime of a system, ii) scheduled/planned maintenance actions, and iii) optimized system operation. For these purposes, different system variables can be monitored and utilized for an estimation of aging level of the system. Monitored system variables are therefore correlated to stochastically occurring damage, indirectly also to Remaining Useful Lifetime (RUL). Among challenges related to SHM, high attention is given to the reduction of a large amount of measured data and its real-time signal processing. In this contribution, classification of damages in composite materials using measurements of Acoustic Emission (AE) is proposed. Here, Discrete Wavelet Transform (DWT) is applied to AE signal to identify different damages in composites. As AE-signal is found in high frequency bandwidth, the amount of data captured in a short time period is enormous. Consequently, the calculation of DWT of such signal requires processing time quite far from real time and delays the entire classification procedure. Due to this, real-time implementation of DWT is proposed to cope with huge amount of captured data in this case and to reduce the time required for signal processing. Using FPGA-based system, real-time implementation of DWT is shown. Obtained results are compared with the results of offline DWT calculation to prove the efficiency and accuracy of real-time implementation.

Keywords: Composite materials , Hardware , Damage

INTEGRATED PROGNOSTIC MODEL FOR RUL ESTIMATION USING THRESHOLD OPTIMIZATION

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Abstract

The capability of prognostic models to estimate loss of machines functionality, enables plant operators to manage the system maintenance and related logistics tasks (spare part management) effectively. Prognostic models will be a key feature and therefore connect the operation of machines and systems in higher modes of automation and factory digitalization, denoted as Industry 4.0 (Germany), Industrial Internet (US), and China 2025 (China) focusing to machines life cycle with respect to reliable and continuous operation and functionality. Prognostic models allow to estimate reliability characteristics mainly related to lifetime and reliability's characteristic (hazard rate, availability). Using the models during operation, operational cost and in the best case due to connected maintenance strategies unscheduled machine downtimes can be reduced. Through appropriate control strategies, it is possible to preserve the service lifetime based on the information of damage accumulation in unpredicted circumstances. Even with inadequate informations extracted from monitoring data, prognostic schemes allow to predict upcoming physical characteristics that permits a higher level of condition-based system maintenance. The optimization of integrated lifetime model becomes vital for accurate estimation of machine's state and therefore the Remaining Useful Lifetime (RUL). In this work, a previously developed, novel state-machine model combined with parametric approaches is extended. The approach can be characterized as parameterized state machine model. During training, experimental data including stochastically effects stress-related data are combined with the moment in time of functional loss; related parameters, and thresholds are combined to define a model by optimization. The threshold optimization will identify the best optimal solution. The application (test) for unknown system data demonstrate that these new kind of prognostic model is able to estimate the RUL with high accuracy. In this paper, the optimization of the model containing the structure of state machine as well as related parameters are discussed. Experimental results demonstrate the effectiveness of the improvement.

HEALTH SERVICE QUALITY MEASUREMENT FROM PATIENT REVIEWS IN TURKISH BY OPINION MINING

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Abstract

Measuring the customer satisfaction is one of the most important aspects for every successful enterprise trying to improve its service quality, so accumulating reviews is highly encouraged. However, as the number of reviews expand it is crucial to develop effective sentiment analysis systems capable of classifying the comments to accomplish further analysis. This is one of the rare studies analyzing health service contentment, especially in Turkish. Positive and negative comments collected from patients were used to train and test a classification system by using machine learning methods such as Naïve Bayes, Support Vector Machine (SMO) and J48 tree algorithms, resulting in instantaneous and high average prediction rates varying between 90.4% to 95.8%.

Keywords: Text classification Turkish Sentiment Analysis Opinion mining Health care reviews classification

E-MEDICAL TEST RECOMMENDATION SYSTEM BASED ON THE ANALYSIS OF PATIENTS' SYMPTOMS AND ANAMNESES

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Abstract

This paper demonstrates an e-medical test recommendation system based on the analysis of patients' symptoms and anamneses. The exact test selection for a specific patient can be time consuming and error-prone due to the huge amount of information to be considered like: the number of tests, patients, long working hours, exceptional cases, etc. The redundant or missing tests can cause serious loss of money, time and more seriously delay in the initiation of the therapy. The study aims to provide a fast and cost effective system for the medical experts and patients. The data are collected from the patient records of a private hospital, preserving anonymity, from all departments. Only the internal medicine department data are utilized. The patients' age, gender and the words used in the anamneses and symptoms as plain text are the input for the system. The texts are analyzed and various methods have been applied for selecting the effective words for recommending a specific medical test. These terms, along with the demographic information, are used as the features of the well-known machine learning algorithms of WEKA [5], namely Sequential Minimal Optimization (SMO), J48, Random-Forest (RF), Bagging (Bagg), ADTree (ADT) and AdaBoostM1 (ABoost). The number of medical tests that are applicable in the hospitals is too high, therefore only 20 most frequently required ones are selected. The promising results of the study indicated that the symptoms given as plain text can be efficiently utilized by the experts for medical test selection.

Keywords: e-Medical Test Recommendation Natural Language Processing Morphological Analysis Machine Learning

CLOUD COMPUTING-BASED PARALLEL GENETIC ALGORITHM FOR GENE SELECTION IN CANCER CLASSIFICATION

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Abstract

Cancer classification is one of the main steps during patient healing process. This fact enforces modern clinical researchers to use advanced bioinformatics methods for cancer classification. Cancer classification is usually performed using gene expression data gained in microarray experiment and advanced machine learning methods. Microarray experiment generates huge amount of data, and its processing via machine learning methods represents a big challenge. In this study, two-step classification paradigm which merges genetic algorithm feature selection and machine learning classifiers is utilized. Genetic algorithm is built in MapReduce programming spirit which makes this algorithm highly scalable for Hadoop cluster. In order to improve the performance of the proposed algorithm, it is extended into a parallel algorithm which process on microarray data in distributed manner using the Hadoop MapReduce framework. In this paper, the algorithm was tested on eleven GEMS data sets (9 tumors, 11 tumors, 14 tumors, brain tumor 1, lung cancer, brain tumor 2, leukemia 1, DLBCL, leukemia 2, SRBCT, and prostate tumor) and its accuracy reached 100% for less than 25 selected features. The proposed cloud computing-based MapReduce parallel genetic algorithm performed well on gene expression data. In addition, the scalability of the suggested algorithm is unlimited because of underlying Hadoop MapReduce platform. The presented results indicate that the proposed method can be effectively implemented for real-world microarray data in the cloud environment. In addition, the Hadoop MapReduce framework demonstrates substantial decrease in the computation time.

Keywords: Cancer classification Gene expression Hadoop MapReduce Parallel genetic algorithm

SOCIAL MEDIA ANALYSIS WEB APPLICATION

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Abstract

Social media is very important factor in analyzing modern society as a whole, their values, norms, and behaviors, as being a part of our everyday life. This study is oriented towards analyzing social media in order to allow users to create their own preferences to follow (analyze) a specific social media source. The web application has been developed to allow a user to follow specific Facebook accounts and categorize the Facebook posts on those accounts based on the user defined taxonomies. Results of this study are various reports generated from the Facebook posts and their statistics that are clustered based on the user defined taxonomies. The benefit of this project is that any user can track in real time when people are talking about some topic, and it enables anyone to have better insight about society as a whole, their values, norms, what they find interesting, and many other things. This tool is also useful for different companies to track the user feedback on social networks for their products.

Keywords: Social Media Analysis, Facebook, Big Data, noSQL Database, Parallel Programming

SYN FLOOD ATTACK DETECTION IN CLOUD COMPUTING USING SUPPORT VECTOR MACHINE

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Abstract

Cloud computing is a trending technology, as it reduces the cost of running a business. However, many companies are skeptic moving about towards cloud due to the security concerns. Based on the Cloud Security Alliance report, Denial of Service (DoS) attacks are among top 12 attacks in the cloud computing. Therefore, it is important to develop a mechanism for detection and prevention of these attacks. The aim of this paper is to evaluate Support Vector Machine (SVM) algorithm in creating the model for classification of DoS attacks and normal network behaviors. The study was performed in several phases: a) attack simulation, b) data collection, c) feature selection, and d) classification. The proposed model achieved 100% classification accuracy with true positive rate (TPR) of 100%. SVM showed outstanding performance in DoS attack detection and proves that it serves as a valuable asset in the network security area.

Keywords: Cloud computing, SYN flood, DoS attack, Support Vector Machine

TRAINING NETWORK MANAGERS IN ETHICAL HACKING TECHNIQUES TO MANAGE RESOURCE STARVATION ATTACKS USING GNS3 SIMULATOR

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Abstract

The threat of resource starvation attacks is one of the major problems for the e-Business. More recently these attacks became threats for Cloud environments and Denial of Service is a sub-category of these kinds of attack. The network management is process of taking proactive actions before the attack has taken effect which is responsibility of skilled employees - network managers. In recent time vulnerability testing skills are needed to harden system security. These skills have to be developed thus for we created scenario in a controlled environment, to provide opportunity for student trainees to train their skills, so that defense could be prepared. This paper describes a simulation-based training scenario using simulator and by using hacking tools in which student trainees experience the symptoms and effects of a DDoS attack, practice their responses in a simulated environment, with goal to prepare them for the real attacks.

Keywords: Tools, Computer crime, Firewalls (computing), Random access memory, Training, Testing

CONGESTIVE HEART FAILURE DETECTION USING RANDOM FOREST CLASSIFIER, COMPUTER METHODS AND PROGRAMS IN BIOMEDICINE

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Abstract

Background and objectives

Automatic electrocardiogram (ECG) heartbeat classification is substantial for diagnosing heart failure. The aim of this paper is to evaluate the effect of machine learning methods in creating the model which classifies normal and congestive heart failure (CHF) on the long-term ECG time series.

Methods

The study was performed in two phases: feature extraction and classification phase. In feature extraction phase, autoregressive (AR) Burg method is applied for extracting features. In classification phase, five different classifiers are examined namely, C4.5 decision tree, k-nearest neighbor, support vector machine, artificial neural networks and random forest classifier. The ECG signals were acquired from BIDMC Congestive Heart Failure and PTB Diagnostic ECG databases and classified by applying various experiments.

Results

The experimental results are evaluated in several statistical measures (sensitivity, specificity, accuracy, F-measure and ROC curve) and showed that the random forest method gives 100% classification accuracy.

Conclusions

Impressive performance of random forest method proves that it plays significant role in detecting congestive heart failure (CHF) and can be valuable in expressing knowledge useful in medicine.

Keywords: *Electrocardiogram(ECG), Congestive heart failure (CHF), Autoregressive (AR) modeling, Machine learning, Random forest*

AN EXTENDED MODEL OF A LEVEL AND FLOW CONTROL SYSTEM

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Abstract

FESTO Compact Workstation is a well known didactic tool in process control. This paper aims at providing an improved transfer function model of this system's level and flow control loops. This higher order model is compared to existing first order system approximations of the level control loop in various input-output scenarios to verify its applicability and superiority. Results are obtained using MATLAB System Identification Toolbox after data acquisition in LabVIEW. MATLAB Simulink is used for cascade PI and single loop PI experiments to show the improvement cascade control on the new model brings. Together with the practical value the results have, the procedure conducted here can serve as a primer and a tutorial for system identification class using this or similar apparatus.

Keywords: Process Control, Modeling, Simulation, Level Control, Flow Control

MANAGEMENT OF THE POWER DISTRIBUTION NETWORK RECONSTRUCTION PROCESS USING FUZZY LOGIC

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Abstract

This paper presents a fuzzy system for management of the power distribution network reconstruction process. The proposed system is based on Mamdani type fuzzy inference which is used to model reconstruction criteria. The system considers number of customers, rate of failure and age of distribution lines as input variables and provides output values used as criteria in a decision making process. The decision making process is based on the Bellman-Zadeh method in which decision making is performed by the intersection of fuzzy goals and constraints. In this paper, fuzzy logic is introduced as a system planning tool in order to account for weaknesses and imprecision of the traditional planning methods. The proposed model is presented as a logical decision making framework which can be used to evaluate and rank power distribution network reconstruction projects according to their ability to deliver long term benefits, both to the utility and customers.

CLASSIFICATION AND COMPARISON OF UNCERTAINTY MODELLING METHODS IN POWER SYSTEMS

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Abstract

Uncertainty is one of the most important factors which contributes to the complexity of the power system operation and management. This paper presents some of the most important uncertainty modelling techniques and compares their advantages and disadvantage. In particular, this paper focuses on identification, classification and comparison of uncertainty modelling approaches used in power systems, highlighting the Distributed Generation (DG) allocation problem. The main objective of this paper is to identify the sources of uncertainty in DG allocation problem, review the most important uncertainty modelling methods and propose the appropriate matching approach between the sources of uncertainty and modelling methods.

PERFORMANCE EVALUATION OF EMPIRICAL MODE DECOMPOSITION, DISCRETE WAVELET TRANSFORM, AND WAVELET PACKED DECOMPOSITION FOR AUTOMATED EPILEPTIC SEIZURE DETECTION AND PREDICTION

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Abstract

This study proposes a new model which is fully specified for automated seizure onset detection and seizure onset prediction based on electroencephalography (EEG) measurements. We processed two archetypal EEG databases, Freiburg (intracranial EEG) and CHB-MIT (scalp EEG), to find if our model could outperform the state-of-the-art models. Four key components define our model: (1) multiscale principal component analysis for EEG de-noising, (2) EEG signal decomposition using either empirical mode decomposition, discrete wavelet transform or wavelet packet decomposition, (3) statistical measures to extract relevant features, (4) machine learning algorithms. Our model achieved overall accuracy of 100% in ictal vs. inter-ictal EEG for both databases. In seizure onset prediction, it could discriminate between inter-ictal, pre-ictal, and ictal EEG with the accuracy of 99.77%, and between inter-ictal and pre-ictal EEG states with the accuracy of 99.70%. The proposed model is general and should prove applicable to other classification tasks including detection and prediction regarding bio-signals such as EMG and ECG.

Keywords: *Electroencephalography (EEG), Epilepsy, Seizure detection and prediction, Multiscale PCA (MSPCA), Discrete wavelet transform (DWT), Empirical mode decomposition (EMD), Wavelet packet decomposition (WPD)*

AN EFFECTIVE COMBINING CLASSIFIER APPROACH USING TREE ALGORITHMS FOR NETWORK INTRUSION DETECTION

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Abstract

In this paper, we developed a combining classifier model based on tree-based algorithms for network intrusion detection. The NSL-KDD dataset, a much improved version of the original KDDCUP'99 dataset, was used to evaluate the performance of our detection algorithm. The task of our detection algorithm was to classify whether the incoming network traffics are normal or an attack, based on 41 features describing every pattern of network traffic. The detection accuracy of 89.24 % was achieved using the combination of random tree and NBTree algorithms based on the sum rule scheme, outperforming the individual random tree algorithm. This result represents the highest result achieved so far using the complete NSL-KDD dataset. Therefore, combining classifier approach based on the sum rule scheme can yield better results than individual classifiers, giving us hope of better anomaly based intrusion detection systems in the future.

Keywords: *Intrusion detection, Tree-based classifiers, NSL-KDD, Combining classifiers approach*

COMPARISON OF SIGNAL DECOMPOSITION METHODS IN CLASSIFICATION OF EEG SIGNALS FOR MOTOR-IMAGERY BCI SYSTEM

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Abstract

In this study, three popular signal processing techniques (Empirical Mode Decomposition, Discrete Wavelet Transform, and Wavelet Packet Decomposition) were investigated for the decomposition of Electroencephalography (EEG) Signals in Brain Computer Interface (BCI) system for a classification task. Publicly available BCI competition III dataset IVa, a multichannel 2-class motor-imagery dataset, was used for this purpose. Multiscale Principal Component Analysis method was applied for the purpose of noise removal. In addition, different sets of features were formed to examine the effect of a particular group of features. The parameter selection process for signal decomposition methods was thoroughly explained as well. Our results show that the combination of Multiscale Principal Component Analysis de-noising and higher order statistics features extracted from wavelet packet decomposition sub-bands resulted in highest average classification accuracy of 92.8%. Our study is one among very few that provides a comprehensive comparison between signal decomposition methods in combination with higher order statistics in classification of BCI signals. In addition, we stressed the importance of higher frequency ranges in improving the classification task for EEG signals in Brain Computer Interface Systems. Obtained results indicate that the proposed model has the potential to obtain a reliable classification of motor imagery EEG signals, and can thus be used as a practical system for controlling a wheelchair. It can also further enhance the current rehabilitation therapies where appropriate feedback is delivered once the individual executes the correct movement. In that way, motor rehabilitation outcomes may improve over time.

Keywords: *Empirical mode decomposition (EMD), Discrete wavelet transform (DWT), Wavelet packet decomposition (WPD), Motor imagery (MI), Brain computer interface (BCI), Higher order statistics (HOS), BCI competition III dataset Iva*

EPILEPTIC SEIZURE DETECTION USING HYBRID MACHINE LEARNING METHODS

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Abstract

The aim of this study is to establish a hybrid model for epileptic seizure detection with genetic algorithm (GA) and particle swarm optimization (PSO) to determine the optimum parameters of support vector machines (SVMs) for classification of EEG data. SVMs are one of the robust machine learning techniques and have been extensively used in many application areas. The kernel parameter's setting for SVMs in training process effects the classification accuracy. We used GA- and PSO-based approach to optimize the SVM parameters. Compared to the GA algorithm, the PSO-based approach significantly improves the classification accuracy. It is shown that the proposed Hybrid SVM can reach a classification accuracy of up to 99.38% for the EEG datasets. Hence, the proposed Hybrid SVM is an efficient tool for neuroscientists to detect epileptic seizure in EEG.

Keywords: Discrete wavelet transform (DWT), Electroencephalogram (EEG), Epileptic seizure, Genetic algorithm (GA), Particle swarm optimization (PSO), Support vector machines (SVMs)

WAVELET AND TEAGER ENERGY OPERATOR (TEO) FOR HEART SOUND PROCESSING AND IDENTIFICATION

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Abstract

The heart sound signal (heartbeat) recorded from normal subjects usually contains two separate tones, S1 and S2. In addition, an auscultation technique used to provide physicians with accurate and objective interpretation of heart sounds can be used to detect four sounds, namely, S1, S2, S3, and S4, during the heart cycle. In this project, we propose a technique to detect these four heartbeats effectively using the combination of multi-scale wavelet transform and Teager Energy Operator to increase the precision of the detection process. The purpose of combining TEO with Wavelets is to observe how different details obtained from the Wavelet Transform influence the Teager Operator success in detecting S1, S2, S3, and S4 heart sounds. The effectiveness of the proposed approach is evaluated in experiments related to different cardiac conditions, achieving 88 % accuracy for localization of S1 and S2, and 86 % accuracy for S3 and/or S4.

Keywords: Heart sounds, Discrete Wavelet Transform (DWT), Teager Energy Operator (TEO), Cardiovascular Diseases (CVD)

HEART SOUNDS DISCRETE WAVELET TRANSFORM (DWT) TEAGER ENERGY OPERATOR (TEO) CARDIOVASCULAR DISEASES (CVD)

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Abstract

This research implements decision tree classifiers and artificial neural network to predict whether the patient will live with ovary cancer or not. Dataset was obtained from Danish Cancer Register and contains five Input parameters. Dataset contains some missing values and a noticeable improvement in accuracy was detected after removing them. Three features of the original dataset were shown to be the most significant: Mobility of the cancer, Surface of the cancer, and the Consistency of the cancer. The addition of the other two features (Size of the cancer and age of the patient) did not improve the results significantly. It was noticed that the patients with a cystic, but fixed and even cancer have always died from the ovary cancer. In contrast, the patients with uneven, but fixed and solid cancer have always survived the cancer. It is recommended to include more information about either the cancer or the patient to increase the chance of predicting the output of such patients.

Keywords: Ovary Cancer, Decision Tree Classifiers, Artificial Neural Network, Feature Selection

OVARY CANCER DETECTION USING DECISION TREE CLASSIFIERS BASED ON HISTORICAL DATA OF OVARY CANCER PATIENTS

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Abstract

It is estimated that there are millions of people with epilepsy around the world. Seizure detection and prediction systems are built to improve lifestyle of patients. Closed-loop systems are designed to predict and detect seizures and inform patient and caretakers. Ideally, wireless technologies are used in order not to interfere with patient's life. We build a prototype for closed-loop systems consisting of Mind Wave EEG capturing device and Android application communicating via Bluetooth. The application can store signals locally or send them to cloud and then process them for different applications such as BCI, Neurofeedback, epileptic seizure prediction, etc.

Keywords: *Android, Electroencephalography (EEG), Closed-loop systems, Mind Wave Mobile Headset*

CRITERIA FOR SOLAR CAR OPTIMIZED ROUTE ESTIMATION

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Abstract

This paper gives a thorough overview of Solar Car Optimized Route Estimation (SCORE), novel route optimization scheme for solar vehicles based on solar irradiance and target distance. In order to conduct the optimization, both data collection and the optimization algorithm itself have to be performed using appropriate hardware. Here we give an insight to both stages, hardware and software used and present some results of the SCORE system together with certain improvements of its fusion and optimization criteria. Results and the limited applicability of SCORE are discussed together with an overview of future research plans and comparison with state-of-the-art solar vehicle optimization solutions.

Keywords: *Vehicle routing, Electric vehicle, Solar vehicle, Navigation, Route optimization*

BERTHIL CEPSTRUM: A NOVEL VIBRATION ANALYSIS METHOD BASED ON MARGINAL HILBERT SPECTRUM APPLIED TO ARTIFICIAL MOTOR AGING

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Abstract

Motor age determination as a part of condition monitoring heavily employs vibration analysis. This study introduces a new method for such analysis, based on concepts of cepstrum and marginal Hilbert spectrum. This new method, named Berthil cepstrum, may be applied in general signal processing, not only when vibration signals are concerned. Classical marginal Hilbert spectrum has also been applied to the artificial motor aging data with excellent results. Furthermore, a ranking of known spectrum-based methods for determination of motor age together with the new methods introduced in this study has been made based on SVM and RELIEF attribute ranking, showing quality of the new methods.

Keywords: *Hilbert transform, Cepstrum Vibration, Condition monitoring, Artificial motor aging*

PRACTICAL IMPLEMENTATION OF SOLAR CAR OPTIMIZED ROUTE ESTIMATION

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Abstract

Solar Car Optimized Route Estimation (SCORE) has been proposed in an earlier publication as an alternative navigation principle for solar cars, conducting route optimization based on both distance and solar irradiance data. This paper gives details about the implementation and discusses results of SCORE's use, suggesting possible limitations and future research directions. The results show limited applicability of solar irradiance data for route optimization, but suggesting that parking place selection is an important aspect that needs to be taken care of. The implementation uses both a MATLAB testbed application and C/C++ code for TI's ARM Cortex-M4F based TM4C123G LaunchPad, and the final version of the SCORE client is placed in a custom built solar vehicle. Combined with the previously developed server for sensor data collection and data processing and sensor transmitter infrastructure for solar irradiation, the route optimization system is fully operational.

Keywords: Navigation, Embedded Systems, Solar Vehicles, Route Optimization

APPLICATION OF TEAGER ENERGY OPERATOR FOR THE POWER SYSTEM FAULT IDENTIFICATION AND LOCALISATION

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Abstract

Power system is constantly exposed to the disturbances. Some disturbances can cause cascading propagation and outages of other generators or transmission lines in the system. Finally, this can lead to partial or total system blackout. Wide Area Monitoring and Protection (WAMPAC) systems based on phasor measurement units (PMU) are strongly improving in order to eventually prevent these dangerous occurrences. This platform presents the basis for the development of smart grids. One of the requirements for smart power systems is the presence of the algorithms for fast and correct identification and localization. In this paper Teager Energy Operator (TEO) is proposed for the processing and analysis of the synchronized measurement signals in order to perform fault identification and localization. Several fault types are simulated in the NE 39 bus test system using the DigSILENT Power Factory software. The results of the fault identification and localization are compared with the Discrete Wavelet Transform (DWT).

SENSOR NETWORK INFORMATION FLOW CONTROL METHOD WITH STATIC COORDINATOR WITHIN INTERNET OF THINGS IN SMART HOUSE ENVIRONMENT

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Abstract

Nowadays the technical solutions related to energy resource management are being rapidly developed and integrated into the daily lives of people. The energy resource management systems use sensor networks for receiving and processing information during the realia time. Despite the large number of research related to increasing the life expectancy of a network, node positioning, network clustering as well as the optimization of the data-processing model, issues related to the data flow management and classification of the information become more and more topical; they allow to reduce the amount of transmitted information within the network. The network load of the unstructured information flow is the most important aspect that impacts the service quality of the network as well as the life expectancy of a node; as a result, the methods of network performance optimization and increase in life expectancy in the networks with a high information transmission rate become ineffective. Nowadays the amount of transmitted information in the Internet of Things networks is increased and becomes chaotic which results in the reduction of the overall network efficiency and life expectancy. The article discusses the management method of the network data flow that can respond to a data flow programming task whilst taking into account the balancing of the node energy in the network.

Keywords: *Sensor NetworkLife expectancyData processingSmart house*

COORDINATOR ROLE MOBILITY METHOD FOR INCREASING THE LIFE EXPECTANCY OF WIRELESS SENSOR NETWORKS

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Abstract

The general problem of wireless sensor network nodes is the low-power batteries that significantly limit the life expectancy of a network. Nowadays the technical solutions related to energy resource management are being rapidly developed and integrated into the daily lives of people. The energy resource management systems use sensor networks for receiving and processing information during the real time. The present paper proposes using a coordinator role mobility method for controlling the routing processes for energy balancing in nodes, which provides dynamic network reconfiguration possibilities. The method is designed to operate fully in the background and can be integrated into any existing working system.

Keywords: Industry 4.0, Life Expectancy, Sensor Network

COMPARATIVE ANALYSIS OF THE CONTROLLERS FOR PUMA 560 ROBOT

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Abstract

Regarding the fact that the industrial robot PUMA 560 is one of the robots with the best mathematical description of its kinematics, it found the new application in the research laboratories for educational purposes. For that reason there is a need to design new controllers which would be compatible with the contemporary CAD tools used for robot movement programming in a graphic manner. Basically, new controllers can be divided into two groups: PC-based and with embedded computer. It is well established that PC computers are known for their unreliability and sensitivity to computer viruses and the suggestion is that the stated shortcomings should be overcome by the use of FPGA based embedded computers. In this paper is suggested FPGA based controller which has to answer the following requirement of the hypothesis: realisation of the robot controller based on FPGA chip (single chip) which contributes the system availability and safety while answering all the functional, safety and economical requirements. The new controller will enable the use of advance CAD tools which is one of the aims of the research.

Keywords: Robot Control, Controllers, Arm Movements, Digital Circuits, Control Algorithms

CLOUD-BASED MOBILE PLATFORM FOR EEG SIGNAL ANALYSIS

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Abstract

It is estimated that there are millions of people with epilepsy around the world. Seizure detection and prediction systems are built to improve lifestyle of patients. Closed-loop systems are designed to predict and detect seizures and inform patient and caretakers. Ideally, wireless technologies are used in order not to interfere with patient's life. We build a prototype for closed-loop systems consisting of Mind Wave EEG capturing device and Android application communicating via Bluetooth. The application can store signals locally or send them to cloud and then process them for different applications such as BCI, Neurofeedback, epileptic seizure prediction, etc.

Keywords: *Android, Electroencephalogram (EEG), Closed-loop systems, MindWave Mobile Headset*

THE ABILITY OF WATER ACCUMULATION MODRAC TO BE SOURCE FOR DRINKING WATER

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Abstract

The largest water management facility in Bosnia and Herzegovina is water accumulation Modrac. Total annual water balance is around 500 million m³. This research examine the possibility of water supply for settlements in the area, as well as providing the necessary amount of technical water for the industry from the Modrac accumulation. Given that Modrac accumulation is the primary recipient of wastewater from settlements and industry, necessary measures for wastewater treatment are defined. Hydraulic analysis of water balance in the accumulation, as well as the amount of water consumed in the settlements and industries, determined are the possibilities of accumulation as a source of drinking water. According to this analysis, the accumulation has potential to be a source of water supply, not only for the city of Tuzla, but the surrounding areas without significant negative impact on the balance of water in the accumulation. It is also concluded that the appropriate treatment of waste water from industry and settlements that gravitate to accumulation, provides better quality of raw water which would be purified into drinking water.

Keywords: Accumulation, Water supply, Specific consumption, potable water treatment, raw water, hydraulic pressure, drinking water quality, water balance

REALNA PRIMJENLJIVOST EKOLOŠKI PRIHVATLJIVIH MATERIJALA I TEHNOLOGIJA U IZGRADNJI ENERGETSKI EFIKASNIH ZGRADA U BIH

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Abstract

Ekspanzija industrije prouzrokovana potrebama ekonomskog rasta i porastom potreba stanovništva u svijetu, praćena je intenzivnom potrošnjom primarnih energenata i nekontrolisanom eksploatacijom prirodnih resursa. Posljedice su vidljive svuda oko nas, zrak, voda i tlo zagađeni su do nivoa da nam je ozbiljno ugroženo zdravlje prije svega. To su problemi koji su se akumulirali prethodnih dva vijeka ali su tek poslednjih decenija postali aktuelni na globalnom nivou. Naftna kriza iz 1973, katastrofa u Černobilu iz 1986 i teorija o klimatskim promjenama i globalnom zagrijavanju su uzdrmale svijet i izvukle ga iz iracionalne nezainteresovanosti za štetu koju nanosimo okruženju i prvenstveno sami sebi. Iluzije o ljudskoj superiornosti nad prirodom i neiscrpnim obiljem su zamijenjene brigom za budućnost i racionalnijim pristupom ka održivom razvoju. Potrošnja fosilnih goriva je identifikovana kao jedan od glavnih uzročnika štetnog uticaja na okolinu. Bez obzira na napore u razvoju alternativnih i forsiranju korištenja obnovljivih izvora energije, učešće fosilnih goriva u ukupnoj proizvodnji energije u svijetu je prema podacima Svjetske banke (The World Bank) još uvijek 87,5% i bilježi blagi porast. U prosjeku 41-45% od ukupno proizvedene svjetske energije se koristi u zgradama. Samim tim značaj i pozitivni efekti povećanja energetske efikasnosti u zgradama su neupitni. Bez obzira na deklarativnu sada već decenijsku posvećenost povećanju energetske efikasnosti zgrada, sve je još uvijek u nekoj ranoj fazi razvoja. Razloga ima više, prvenstveno zbog tipske inertnosti građevinske industrije, zatim neadekvatne zakonske regulative i standardizacije, ekonomskih barijera i zastoja u razvoju novih tehnologija. Postoji i vidljiv otpor u prihvatanju novog načina razmišljanja i praktičnoj primjeni, posebno jer su kriterijumi za energetske efikasnosti upotpunjeni i kriterijumom ekološke prihvatljivosti. Novi pristup razvoju projekta u građevinarstvu je zasnovan na detaljnoj analizi ukupnih efekata budućeg objekta, kroz procese dizajniranja, izgradnje i upotrebe sve do potencijalnog kraja njegovog postojanja. To

podrazumijeva analizu ekološkog, ekonomskog i kulturološkog efekta izgradnje zgrade, životnog ciklusa upotrijebljenih materijala i tehnologija, kapaciteta zgrade i njene interakcije sa okolinom, komfora prostora i mogućeg uticaja na zdravlje budućih korisnika. Energetska efikasnost zgrada se na prostorima BiH uglavnom poistovjećuje sa upotrebom „što debljeg“ termo izolacionog sloja na fasadama i termo izolacionog stakla na otvorima zgrade. Kada su u pitanju ekološki prihvatljivi materijali to je još uvijek pastoralna priča o drvetu, blatu, slami, kamenu i vuni. Upotreba nekih od tehnologija za pasivnu ili aktivnu uštedu energije je zanemariva. Svakako da se može naći opravdanje za takvo stanje stvari ali postoji i prostor za poboljšanja. Cilj ovog rada je da se evidentira problematika i ukaže na realne mogućnosti promjena u pristupu izgradnji energetske efikasne zgrade u BiH.

Keywords: *Industrijalizacija, životna sredina, održivi razvoj, ušteda energije, izgradnja, ekološka prihvatljivost, materijali, tehnologije*

EXPERIENCE IN TESTING OF CONCRETE FOR WATER PENETRATION DURING CONSTRUCTION OF WWTP IN BIHAĆ

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Abstract

Water tightness defines the resistance of concrete structures to the penetration of water under specific pressure. Since hydrotechnical structures are mainly made of reinforced concrete and are used for water retention, these facilities must be watertight, so special attention is paid to the concrete mix design, including admixtures. Thus, satisfying this criteria was unavoidable during the design and construction of the Wastewater Treatment Plant in Bihać, as a part of the Project for Collection and Treatment of Waste Water. Consequently, testing of water resistance of concrete was conducted according to EN 12390-8:2010, and goal of this paper is to present this experience through data processing and test results.

Keywords: *Water resistant concrete, Concrete Quality control, Waste Water Treatment Plant in Bihać*

EXPERIENCE IN TESTING OF CONCRETE REINFORCEMENT ACCORDING TO EN 10002-1

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Abstract

Construction of Waste Water Treatment Plant (WWTP) is a second component of the Waste Water Collection and Treatment Project in Bihać. WWTP Project included design and construction of complex hydro technical facilities that represent technological parts for waste water treatment. Since majority of facilities of WWTP are designed and constructed as reinforced concrete structures, a special attention was given in quality control of concrete and reinforcement. This paper's focus is the quality control of installed concrete reinforcement at the construction site of WWTP. The aim of the paper is to show, emphasize and share experience with professional community in application and implementation of European norm for concrete reinforcement - EN 10002-1 in Bosnia and Herzegovina.

Keywords: EN 10002-1, Testing, Reinforcement Quality Control, Waste Water Treatment Plant

APPLICATION OF CPR 305/2011 TO PRECAST CONCRETE ELEMENTS

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Abstract

This paper introduces the method of implementation of the European Parliament and the Council Construction Products Regulation No. 305/2011 for precast concrete products. The Regulation defines the conditions for placement of construction products in the internal market of the European Union, as well as methods and systems for conformity assessment to demonstrate the continuity of the characteristics of construction products. There are authorities to control the internal market community, in the countries of the European Union, whose main task is to control whether the product and supporting documentation meet the requirements of the Regulation. This work focuses to conformity assessment of precast concrete products in accordance with European harmonized standards. Meeting the requirements of the Regulation and harmonized standards for precast concrete products, the product can be introduced to the EU market.

Keywords: CPR Regulation, Precast Concrete Elements, Quality, CE Marking

ACCREDITED LABORATORIES IN PROCESS OF INTRODUCING OF CONSTRUCTION PRODUCTS TO EU MARKET

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Abstract

Laboratories that tend to be competitive in the international market must establish, document, apply and maintain a quality management system according to EN ISO/IEC 17025 - General requirements for the competence of testing and calibration laboratories. Acceptance of testing results among countries should be easier if laboratories comply with ISO/IEC 17025, and will also improve cooperation among laboratories. Accreditation of laboratories is used worldwide as a vehicle to verify their technical competence to conduct specific types of tests. Customers require confidence in the safety and quality of products purchased. The accreditation of laboratories provides confidence in test results and it is an evidence of their competence as well. The paper gives an overview of the current status of accredited laboratories for construction products in Bosnia and Herzegovina. The appropriate testing and certification of products are of great importance for the economy of Bosnia and Herzegovina, if accepted and recognized by the EU member states. This is possible to be done in the framework of own infrastructure, including affordable prices. There are many industrial fields of expertise in which technical regulations require testing of products conducted in accredited laboratories.

Keywords: Laboratories Accreditation, ISO/IEC 17025, Construction product

CARBON FIBERS - MATERIAL OF NEW POSSIBILITIES

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Abstract

Carbon fibers were patented in 1957 by Roger Bacon in the laboratory of Union Carbide, Ohio, Cleveland, USA. In the beginning, they were not being applied in the construction industry. However, the development of technology for their production, their mechanical properties, especially the ability to take over tensile forces, low self-weight, durability, resistance to corrosion and chemicals, and relatively simple application candidate this material for the material of the future in the construction industry and civil engineering. Their high cost is the reason why carbon fibers are not applied more in construction, at the moment. Carbon fibers are mostly currently used in the construction for reinforcement of concrete and timber structures and joints, for the rehabilitation of structures damaged by the action of seismic forces and fire, as well as to increase the load-bearing capacity of structures due to increased static and dynamic loads caused by change of occupancy of different structures, as well as for the rehabilitation of pavements. The application of carbon fibers in Bosnia and Herzegovina is squeezed to relatively limited number of cases.

Keywords: Carbon bers, Carboplate sheets, Tensile forces, Reconstruction

EXPERIENCES IN TESTING OF COMPRESSIVE STRENGTH OF CONCRETE DURING CONSTRUCTION OF WASTE WATER COLLECTION AND TREATMENT PLANT IN BIHAĆ ACCORDING TO BAS EN 206:2014

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Abstract

Concrete structures need to meet requirements of load bearing capacity, but also requirements of serviceability and durability. BAS EN 206:2014 defines the requirements for sampling and testing of concrete, and the final assessment of the conformity and identity of concrete to designed class. This paper presents some experiences in concrete quality control conducted during the construction of Wastewater Treatment Plant in Bihac according to the newest BAS EN 206:2014. The aim of this paper is to exchange experience with professional community in concrete quality control in line with this newest standard.

Keywords: *Concrete Compressive Strength, Waste Water Treatment Plant, Concrete Quality Control, Testing*

CONCRETE CONSISTENCY TESTING DURING CONSTRUCTION OF THE WASTE WATER COLLECTION AND TREATMENT PLANT IN BIHAĆ ACCORDING TO EN 206:2014

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Abstract

Workability of fresh concrete mix or possibility of work with concrete is very important during construction. Concrete elements have different shapes and dimensions of cross-sections, schedules of reinforcement, while concrete is installed in different ways and using different means for casting and compacting. In this sense, it is necessary to specify the correct consistency class of concrete. The goal of this paper is to present the experience of the consistency testing of concrete, using slump and flow test according to BAS EN 206:2014 during construction of the Waste Water Treatment Plant in Bihac (WWTP).

Keywords: Concrete, Consistency of Concrete; Testing, Waste Water Treatment Plant in Bihac

INSULATION MATERIALS – REACTION TO FIRE AND ENVIRONMENTAL ASPECTS

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Abstract

There is a relatively wide variety of thermal insulation materials in the market for the building construction. Most recently, traditional insulating materials such as sheep wool and baled straw for the construction of "green buildings" regain their importance. However, in the conventional construction practice, almost 90% of the application of insulating materials are stone and glass wool, expanded and extruded polystyrene and polyurethanes. The purpose of this paper is to address aspects of the reaction to fire, and fire behavior of these materials, as well as environmental aspects and impacts on public health, which could contribute to the raising awareness of designers and the general public to take into consideration the parameters listed in this paper during selection process of the most appropriate insulating material for actual building or specific application.

Keywords: *Insulation materials, Reaction to fire, European Classifications*

FIRE RESISTANCE OF THE STRAW BALE WALLS

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Abstract

Straw as construction material deserves considerable attention as a natural, energy and environmentally sustainable material in the modern period of building sustainable creation. Straw bales meet the requirements of sustainable architecture, but different researches have also shown satisfying specific significant level of certain mechanical characteristics. In this paper, fire resistance of load-bearing and non-loadbearing plastered and un-plastered walls made of baled straw, or wall panels with insulation of baled straw was considered. Fire resistance tests of the straw baled walls are relatively rare in the world and performed in accordance with different standards. Practically, almost all findings of such tests show a surprisingly encouraging results.

Keywords: *Straw Bales, Walls, Fire Protection*

EARLY MUSEUMS AS SYMBOL OF NATIONAL IDENTITY

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Abstract

This paper traces the role of the museum as a tool in the formation of national identity, in Bavarian kingdom, during the late eighteen and early nineteenth centuries. The importance of the museums in Berlin and Munich, built under the rule of Ludwig I, is that they helped to forge the new museum typology that were applied to other European cities with the same intent. The paper examines three museums from Munich and Berlin: The Altes Museum, the Glyptothek and the Alte Pinakothek. It seeks to establish the relationship between the content or the collection and the container or the building itself as well as the expression of this phenomena into the architectural language.

Keywords: *Museum, Collective Identity, Civic Architecture, Nationalism, Cultural Buildings*

CROSSING SITELINES / TRAGUARDARE L'ADRIATICO (BOOK CHAPTER)

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Abstract

I numero 35 della collana Re-Cycle ITALY — Nuovi cicli di vita per architetture e infrastrutture di città e paesaggio — contiene la ricerca di una delle componenti dell'unità di Pescara — Università G. d'Annunzio - (coordinatore Francesco Garofalo). Il lavoro nasce da una serie di sguardi incrociati attraverso l'Adriatico che, a partire da Pescara, ha traguardato verso molte città dell'Euro-Regione Adriatica e dei Balcani (Rijeka, Zagabria, Belgrado, Spalato, Durazzo, e Sarajevo). Con il contributo di colleghi e ricercatori delle diverse città, il lavoro ha affrontato letture e interpretazioni dei contesti e definito processi e strategie di ri-generazione e riciclo urbano, all'interno di una aggiornata visione geourbanistica dell'intera regione che veda nella cultura e nella forza delle idee gli strumenti principali per creare ponti e stabilire connessioni e nel rapporto tra geografia, urbanistica e architettura la sua possibile nuova matrice identitaria.

ARS AEVI: LA CULTURA COME ARMA

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Abstract

Conceived during the siege of Sarajevo, with the city under bombardment, Ars Aevi contemporary art museum is the outcome of an extraordinary story. By involving the world's most important artists, it became the emblem of the city's cultural resistance and the will to foster multicultural values.

APPLICATION OF THE MONITORING TOOLS FOR UNIVERSITY DEPARTMENTS OF ARCHITECTURE DEVELOPMENT AND IMPROVEMENT PROJECTS

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Abstract

Projects aimed to improve education systems, especially at universities, are the best way to create the better future, but examples until recently showed that such projects were usually too slow in implementation and sometimes avoided. Recently, universities have become aware that trends and needs are changing almost on daily basis and that improvement of the system once in a few years is not sufficient, rather the improvement is continuous process. In that regard, departments' management should become more open to such improvements. Opening of the universities to more improvements brought number of issues regarding what exactly and how improvements should be implemented. Decision making in such project implementation should be made based upon clear evidences and trends. This paper assesses and focuses to the application of monitoring and evaluation tools in project management for tracking development of university department of architecture and will propose a set of activities and performance indicators in support to implementation of strategic objectives believed to contribute to better education process. In addition, the paper suggests how and which results in each phase of the project implementation should be monitored as a basis for assessment of the project goals in improvement of organizational effectiveness and efficiency, curriculum development, staffing, students participation, including stakeholders engagement, recognition of the department and market validation, taking quantitative, qualitative and psychological aspects into consideration.

Keywords: *Monitoring and Evaluation, Department of Architecture, Education System*

COMPARISON OF THE APPLICATION OF THE CRITICAL PATH ANALYSIS AND GANTT CHART APPROACH IN PROJECT MANAGEMENT

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Abstract

Gantt charts are commonly used in Bosnia and Herzegovina as a planning basis for the construction of engineering and architectural structures. Although very simple and transparent in everyday use, they have a range of shortcomings. The main disadvantage of a Gantt chart is lack of interdependence between individual activities. Interdependence is established subjectively, based upon empirical experience of planners or project managers. Therefore, it is difficult to perform correct managerial decisions, which ultimately leads to serious problems in the implementation of the project, construction delays, and even waste of resources, including suffering of contractual penalties. Critical path analysis establishes dependencies between activities in the implementation of the project, which leads to a sequence of activities on the critical path, as well as the identification of activities that can have a float in project implementation. Based on this technique, it is possible to make appropriate managerial decisions and intervene in a technically and managerial correct manner, based on the performance data. This paper and the conclusions of the analysis on four case studies will justify the application of the critical path analysis versus Gantt chart planning in project management.

Keywords: Planning, Gantt chart, Critical Path Analysis, Project Management

USER – BASED APPROACH IN THE PLANNING AND CONFIGURATION OF LIVING SPACES

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Abstract

In the contemporary world the lack of living spaces — environments of dormitory facilities and proper accommodation for students is more than evident. Worldwide migrations of university students is triggering a huge market that is offering various opportunities of accommodations, and it is more than often that the offered accommodation is not satisfying the living requirements of students as individuals, which is directly influencing their success in educational process. One of potential reasons for unsuccessful accommodation condition lies in the fact that in most of the countries the dormitory facilities are not the buildings originally designed with the function of dormitories, but they are adaptation of the buildings that were constructed with other primary functions and purposes. Another reason might be hidden in the sorrow reality that architects in the planning and configuration approach might be making some intentional (omissions that are justified by market demands) an unintentional mistakes that are based on the lack of knowledge and understanding of the way of living of students, and their priorities and living requirements. In this study the aim is to determine the significance of user based approach in the process of configuration of living spaces in the case of dormitory facilities and priorities among the principles that are adding the essential meaning of living environment for students in the frame of dormitory facilities and it has been done through evaluation of several examples of dormitories of contemporary world, as well as through the revision of standards and principles related to planning and configuration of living spaces of dormitory facilities.

Keywords: *Dormitory, Privacy, Habituation, Belongingness, Motivational needs, Basic needs*

A REVIEW ON SHEARING OF SINGLE LIVING SPACE IN RESIDENTIAL ARCHITECTURE

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Abstract

This paper traces the rules that are governing the use of living spaces in the cases when two or more users — inhabitants are reduced to share the space and live together. As such, this research aims to present the minimum living requirements of one human individual — user that are supposed to be satisfied within the process of planning of configuration of spaces that are expected to accommodate the users and to expose the principles and rules that should be followed through the process of architectural planning and design. This research is based on observations made within the qualitative analysis method, in the frame of which the selected examples and illustrations will be evaluated and properly compared according to the standards and architectural planning principles related to the rules of configuration of living spaces. This study gives the better insight into the principles of configuration of living spaces that are planned to govern the shearing of one living space and evaluates the 'minimums' that are required to be satisfied for each individual — for each user / inhabitant. Complete focus of this research is based on the functional organization of single room for teenage children within the residential complexes and dormitory facilities, and through this review it is aimed to follow the possible traces of simplified understandings of the relations between users (as individuals), actions — functions, and living space.

Keywords: *Living space, Shearing, Areas of Activities, Individual areas, Basic needs*

THE ENVIRONMENTAL AESTHETICS OF SARAJEVO: A CITY SHAPED BY MEMORY

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Abstract

This article discusses aesthetic singularity in present-day Sarajevo and shows how time generates a social response to the visual quality of space. Acknowledging the meta-morphosis of the cityscape with regard to the identity reformulation of postwar Sarajevo, it examines the sensor engagement of people with the urban environment in relationship to the traumatic events and shifting realities imposed by globalisation. The hypothesis is that the environmental aesthetics of post-war Sarajevo are defined by the traumatic memory of physical and social destruction. This article offers insight within a broad range of theoretical discussions on the changes in the visual language and aesthetic quality of urban spaces in post-war Sarajevo. In particular, it presents the notion of urban memory and its role in shaping the aesthetic experience in post-war cities. Finally, the findings show that architectural remnants, or ruins in the urban fabric, instead of being unstable entities, have the potential to become drivers of a continuum. Ultimately, this article accepts the values of incompleteness and opens new perspectives towards playful experimentation, which potentially relieves the aesthetic experience of a rigid and monotonous urban image.

Keywords: *Aesthetic Experience, Urban Memory, Visual Language of a City, Value of Ruins, Valued Perception*

BIO-BASED STUDENT PAVILION IN SARAJEVO, BOSNIA AND HERZEGOVINA

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Abstract

Construction sector pollutes the environment the most and it is followed by transportation. Energy resources are depleting and there is a great need for use of renewable energy resources. People spend 80% of their time in their homes. The air quality of these homes is poor due to the chemical and synthetic construction materials use. Most of the construction materials utilized in common construction have small or no recyclability potential. This paper presents a project by International Burch University in cooperation with Green Council that aims to propose a solution for some of the challenges listed above. Student Pavilion is a low-energy house built of bio-based, local building materials that provide healthy air quality for its inhabitants, pleasant and spiritually uplifting environment to live in. Furthermore, since they are natural, these materials are almost 100% degradable. Student Pavilion is being constructed in Sarajevo, on International Burch University campus and it consists of wooden frame structure, straw-bale walls with natural plastering, reused windows and doors, straw-bale floor and roof insulation and green roof. Wool insulation is also used on the roof and portion of the wall. First construction phase of Student Pavilion was completed in September of 2016 through summer school when 15 students together with the experts and professors participated. The goal of this summer school was to educate the students bio-based, sustainable building techniques. The plan is to complete the construction of this house in summer of 2017. This house will serve as a laboratory for future research. This is why the sensors will be placed in this house that measure temperature and humidity of different wall configurations as well as CO2 levels in the house. Thermal imaging and air tightness tests will be conducted. The plan is to conduct long-term measurements with the first ones to be published after a year of construction.

PROPERTIES OF BUILDING MATERIALS ENVIRONMENTAL IMPACTS AND COST OF BIO-BASED HOUSE VERSUS CONCRETE-BRICK HOUSE

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Abstract

In order to reduce the amount of energy being spent in the construction industry and to achieve the EU Climate and Energy Package goals by 2020, new ways of constructing houses are required. This research proposes construction of bio-based nearly zero energy or passive houses as one solution. For this research paper, typical house construction methods in the Balkan region are analysed and compared to current Austrian house construction methods (in particular, straw bale house built to passive house standards), since Austria is now one of the leading countries in Europe when it comes to offering smart and eco-friendly construction methods. This paper aims to enhance the understanding of the environmental performance of straw bale house in the Balkan region, develop the mainstream acceptance and use of straw as a construction material by proving that, such home is not only healthier for the environment, but also economically justifiable to construct than concrete-brick homes usually built in this region of the world. This is done via energy analysis in both BIM and Baubook software, construction cost calculation and comparison of two different house types virtually placed in Bosnia and Herzegovina as a representative country of Balkan region: • Type 1: bio-based house: Stone with lime foundations, wooden bearing structure, straw bale walls, no traditional heating and air conditioning, green roof, etc. House is designed to passive house standard. • Type 2: concrete house: Type 1 geometry, but different building materials (reinforced concrete structure with brick walls, Styrofoam insulation). It will be determined if this house complies with EU Standards in regards to energy efficiency. This research proves that bio-based house is in compliance with Passive House Standards, more energy efficient and affordable to construct and maintain. Keywords Bio-based house, nearly zero energy house, passive house, straw bale, energy analysis, BIM, Baubook.

ANALYSIS AND COMPARISON OF ENVIRONMENTAL IMPACTS AND COST OF BIO-BASED HOUSE VERSUS CONCRETE HOUSE

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Abstract

In order to reduce the amount of energy being spent in the construction industry and to achieve the EU Climate and Energy Package goals by 2020, new ways of constructing houses is required. This research proposes construction of bio-based nearly zero energy or passive houses as one solution. Typical house construction methods in the Balkan region are analysed and compared to current Austrian house construction methods (in particular straw bale house built to passive house standards), since Austria is now one of the leading countries in Europe when it comes to offering smart and eco-friendly construction methods. This paper aims to enhance the understanding of the environmental performance of straw bale house in the Balkan region, develop the mainstream acceptance and use of straw as a construction material by proving that, such home is not only healthier for the environment, but also economically justifiable to construct than concrete/brick homes usually built in this region of the world. This is done via energy analysis in both BIM and Baubook software and construction cost calculation and comparison of two different house types virtually placed in Bosnia and Herzegovina as a representative country of Balkan region. Type 1 is bio-based house, while Type 2 is concrete house of similar geometry. During the analysis, it was discovered that Type 1 house is in compliance with passive house standards, while Type 2 isn't. Furthermore, energy use intensity according to BIM analysis for Type 1 is half of the value of the Type 2 house. Peak heating load for Type 2 house is much larger than for the Type 1 house. Global warming potential of Type 1 house is negative, which means that bio-based materials absorb CO₂ during its life. Global warming potential for Type 2 is 435.02 kgCO₂/m². In addition to this, it costs slightly less to construct Type 1 house than Type 2 house. Therefore, this paper proves that Type 1 – Bio-based house is cheaper to construct and more energy efficient than Type 2 – Concrete house that is typically being constructed in the Balkan region.

Keywords: Bio-based house, Concrete house, Environmental impact, Cost, BIM, Energy analysis

LOCAL, TRADITIONAL, NATURAL MATERIALS FOR A SUSTAINABLE FUTURE

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Abstract

Joining the European Union is a strategic priority of Bosnia and Herzegovina. The energy efficiency sector is sector which is discussed a lot and which brings together a large number of stakeholders, but unfortunately it is currently characterized by a great lack of connection, unsustainability and superficiality. Bosnia and Herzegovina is a country with a rich tradition of construction with local and natural materials. There are many examples of preserved traditional buildings, live old crafts, as well as the enormous potential of natural resources which all together open up possibilities characteristic only for few countries in Europe. Analyses indicate rich forest resources, richness in high-quality wood materials, tradition in the processing and manufacturing of wood. The existing infrastructure does not require large investments, but it requires a clear vision and financial development support. Besides the tradition and potential in the wood industry, great potential of the textile industry is recognized-industry which traditionally has also been well-developed and stable, which today can serve as a strong basis for the adjustment of clean technologies for production of insulation panels from sheep's wool, as well as from recycled textiles and other materials. In addition to sheep's wool, B&H also has the potential in other materials such as straw, clay and lime managed in the sector of agriculture and rural development. It was noted that current activities in the field of energy efficiency are focused primarily on the first part of the energy efficiency definition which refers to the use of less energy, while a very important element of this definition is being ignored, element that refers to the care of life quality improvement. Solving optimal ventilation and recuperation system, as well as concern about the use of non-toxic materials, must also be a priority for future energy efficiency projects in B&H. Exactly Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings, which introduced the categories of primary energy and CO₂ emissions in the process of certification, becomes a Directive that should be also the goal for us in B&H. The energy efficiency sector can provide an opportunity for creating a wide range of new jobs in B&H.

Keywords: Sustainable Development, Energy Efficiency, Local Natural Resources, Interdisciplinary Coordination, CO₂, Green Jobs

APPLICATIONS OF QSAR STUDY IN DRUG DESIGN

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Abstract

Quantitative structure-activity relationship (QSAR) and quantitative structure-property relationship (QSPR) studies are important in silico methods in rational drug design. The aim of this methods are to optimize the existing leads in order to improve their biological activities and physico-chemical properties. Also, to predict the biological activities of untested and sometimes yet unavailable compounds. This article is a general review of different QSAR/QSPR studies in different previous researches. R2 and Q2 parameters are used in some studies to predict the predictability and robustness of the constructed models. In all mentioned articles QSAR study were good prediction tool for investigation drug activity or binding mode on specific receptors.

Keywords: Drug design, QSAR, QSPR, Molecular Descriptor, Coefficient of Determination R2, Squared Correlation Coefficient Q2.

GENOTYPE ASSOCIATION WITH SPORT ACTIVITY: THE IMPACT OF ACE AND ACTN3 GENE POLYMORPHISM ON ATHLETIC PERFORMANCE

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Abstract

The purpose of this paper is to provide an overview of genes that have an impact on athletic performance. In recent years, there is a visible progress in molecular biology techniques, which facilitate researches in the field of genetics related to the sport performance. The paper focuses on 2 genes which are most intensively studied in relation to the athletic ability – angiotensine I-converting enzyme (ACE) and alpha-actinin 3 (ACTN3). There are shown results from many researches, and they indicate that genetic factors have effect on sports performance, but also impact of training and environment is important. With new approaches, new polymorphisms are discovered, so research of this area of genetics is still in progress.

Keywords: Athletic Performance; Genetics; Polymorphism; Genotype; Endurance; Strength; ACE; ACTN3.

TESTING OF ANESTHESIA MACHINES AND DEFIBRILLATORS IN HEALTHCARE INSTITUTIONS

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Abstract

To improve the quality of patient treatment by improving the functionality of medical devices in healthcare institutions. To present the results of the safety and performance inspection of patient-relevant output parameters of anesthesia machines and defibrillators defined by legal metrology. This study covered 130 anesthesia machines and 161 defibrillators used in public and private healthcare institutions, during a period of two years. Testing procedures were carried out according to international standards and legal metrology legislative procedures in Bosnia and Herzegovina. The results show that in 13.84% of tested anesthesia machine and 14.91% of defibrillators device performance is not in accordance with requirements and should either have its results be verified, or the device removed from use or scheduled for corrective maintenance. Research emphasizes importance of independent safety and performance inspections, and gives recommendations for the frequency of inspection based on measurements. Results offer implications for adequacy of preventive and corrective maintenance performed in healthcare institutions. Based on collected data, the first digital electronical database of anesthesia machines and defibrillators used in healthcare institutions in Bosnia and Herzegovina is created. This database is a useful tool for tracking each device's performance over time.

Keywords: Anesthesia machine; Clinical engineering; Defibrillator; Inspection; Safety

THE INFLUENCE OF ERYTHROPOIETIN (EPO) ON CANCER CELLS AND ITS ROLE IN THE CANCER TREATMENT

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Abstract

The hormone erythropoietin (EPO) is essential for the survival, proliferation and differentiation of the erythrocytic progenitors. The EPO receptor (EPO-R) of erythrocytic cells belongs to the cytokine class I receptor family and signals through various protein kinases and STAT transcription factors. The EPO-R is also expressed in many organs outside the bone marrow, suggesting that EPO is a pleiotropic anti-apoptotic factor. The controversial issue as to whether the EPO-R is functional in tumor tissue is critically reviewed. Importantly, most studies of EPO-R detection in tumor tissue have provided falsely positive results because of the lack of EPO-R specific antibodies. However, endogenous EPO appears to be necessary to maintain the viability of endothelial cells and to promote tumor angiogenesis. This review paper reviews EPO use in cancer patients and its management of anemia. While the findings promise beneficial effects of endogenous EPO and its therapeutic analogues as tissue-protective factors, for example in ischemic and degenerative heart and brain diseases, fear has also arisen that EPO may promote tumor cell survival and stimulate tumor growth. If the cancer patient is being treated with curative intent, the use of ESAs should be avoided. If the treatment plan is more conservative or palliative, ESA should be considered for anemia treatment, but the treatment should be controlled.

Keywords: Erythropoietin (EPO); Proliferation; Tumor Tissue; Tumor Angiogenesis.

METHODS FOR THE PRESERVATION OF PERIODONTAL LIGAMENT CELLS USING DIFFERENT STORAGE MEDIA

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Abstract

This paper presents a review of different storage media and their efficiency in retaining periodontal ligament (PDL) cell vitality before replantation. After avulsion of a tooth, immediate replantation is recommended, however this is often not possible. Therefore, storage media that are affordable and readily available are required to avoid resorption and tooth death by preservation of the PDL cells. Numerous studies have been undergone and use of media such as Hank's Balanced Salt Solution (HBSS), milk, aloe vera, coconut water, and et cetera have been trialed. In order to find the storage media that best meets the price/quality ratio, this study compares the length of time that the aforementioned solutions for retaining PDL vitality, their pH and osmolality, and discusses their efficiency in terms of other in vitro experiments. The media that are compared in this study are Hank's Balanced Salt Solution (HBSS), milk, aloe vera, coconut water, egg albumin, and contact lens solution. Results provide that HBSS and coconut water have the longest retention time, however milk, aloe vera and egg albumin are also effective for shorter periods of time.

Keywords: Periodontal ligament cells, Avulsion, Resorption, Storage media, Vitality

ARTIFICIAL NEURAL NETWORK AND DOCKING STUDY IN DESIGN AND SYNTHESIS OF XANTHENES AS ANTIMICROBIAL AGENTS

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Abstract

The aim of the study was to investigate the efficiency of artificial neural networks and docking studies in prediction of antimicrobial activity for new compounds. For that purpose, two multilayer neural networks with feedforward architecture were developed. Also, docking studies were performed to investigate the hypothetical binding mode of the target compounds. A series of 2,2,5,5-tetramethyl-9-aryl-3,4,5,6,7,9-hexahydro-1H-xanthen-1,8(2H)-dione derivatives have been previously synthesized, characterized and evaluated for in vitro antimicrobial activity against Escherichia coli and Candida albicans strains. By comparing results of in vitro investigation, new 2,2,5,5-tetramethyl-9-(3,5-dibromophenyl)-3,4,5,6,7,9-hexahydro-1H-xanthen-1,8(2H)-dione possessed better antimicrobial activity against tested microorganisms than previously synthesized derivatives and these results also correlated well with results of docking studies.

Keywords: Xanthenes, Artificial neural network, Docking study, Antimicrobial activity, Biological activity prediction, Receptor-ligand binding

CLASSIFICATION OF METABOLIC SYNDROME PATIENTS USING IMPLEMENTED EXPERT SYSTEM

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Abstract

This paper presents the development of an Expert System for the classification of metabolic syndrome (MetS). Two-layer feedforward Artificial Neural Network (ANN) with sigmoid transfer function is used for MetS classification. In accordance with international guidelines NHBL/AHA, classification is performed based on following input parameters: waist circumference, blood pressure, glucose level, HDL cholesterol and triglycerides. Samples for training of developed Expert System are obtained from 1083 patients at hospitals in Bosnia and Herzegovina. Testing of developed system is performed with 300 samples, also acquired from patients in hospitals in B&H by medical professionals. Out of 300 samples, 155 samples were of MetS while the rest was of healthy subjects. Developed Expert System correctly classified 283 MetS samples, therefore the sensitivity of 96% is achieved and specificity is 92,7%.

Keywords: Expert System, Metabolic Syndrome, Artificial Neural Network

PRE-CLASSIFICATION PROCESS SYMPTOM QUESTIONNAIRE BASED ON FUZZY LOGIC FOR PULMONARY FUNCTION TEST COST REDUCTION

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Abstract

In the past few years, developing of computer-aided systems for disease classification has been investigated more extensively. Medical professionals use these systems as assistance in diagnosis since they perform the diagnosis based on larger, more complex set of new and previously stored information. Those computer-aided systems are equipped with graphical user interface that makes application in everyday situations more convenient. Disease classification in most computer-aided systems is based on expert systems. Beside the Artificial Neural Networks (ANNs), fuzzy logic (FL) or some other tools are often used for this purpose. This study presents the results of disease pre-classification process and determining the need for conducting respiratory function tests such as spirometry (SPIR), Impulse Oscillometry (IOS), or Body plethysmography and running the Fuzzy Logic – Artificial Neural Network (FL-ANN) Expert System for classification of respiratory diseases. This pre-classification algorithm optimizes time resources as well as reduces the costs of medical device use needed for testing of patient and costs of medical professional attending the measurement. Questions and symptoms used in pre-classification are based on Global Initiative for Asthma (GINA) and Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines. The pre-classification algorithm is validated on 5000 reports acquired from subjects prospectively enrolled in the Hospital in Sarajevo during the period of

two year and CareFusion Database for the last 10 years. Sensitivity of 97.26% and specificity of 90.74% is achieved. It is shown that saving around 97% on pulmonary functions tests can be achieved by introducing these automated systems in everyday practices.

Keywords: *Fuzzy logic, Artificial Neural Network, COPD, Asthma, Disease, Classification, Expert System, Artificial intelligence, Decision support system, Computer-aided, Automated classification*

CLASSIFICATION OF PREDIABETES AND TYPE 2 DIABETES USING ARTIFICIAL NEURAL NETWORK

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Abstract

In this paper development of Artificial Neural Network for classification of prediabetes and type 2 diabetes (T2D) is presented. For development of this system 310 samples consisting of information about Fasting Plasma Glucose (FPG) and blood test called HbA1c were used. All samples were obtained from several healthcare institutions in Bosnia and Herzegovina, and diagnosis of prediabetes, T2D and healthy patients in this dataset were established by medical professionals. Two-layer feedforward backpropagation network with 15 neurons in hidden layer and sigmoid transfer function, used for classification of prediabetes and T2D in this paper, was trained with 190 samples. Testing of developed neural network was performed with 120 samples for validation also obtained from healthcare

institutions in Bosnia and Herzegovina. Out of 120 samples, developed network was accurate in 94.1% cases for the classification of prediabetes and in 93.3% cases for classification of T2D.

Keywords: *Prediabetes, Diabetes type 2, Fasting Plasma Glucose, HbA1c, Classification, Artificial Neural Network, Pattern Recognition*

TESTING OF INFUSION PUMPS IN HEALTHCARE INSTITUTIONS IN BOSNIA AND HERZEGOVINA

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Abstract

This paper presents the results of safety and performance inspection conducted on 325 infusion pumps in the period from January 2015 to January 2016 in public and private healthcare institutions in Bosnia and Herzegovina. Electrical safety inspection was conducted according to IEC 60601 - Medical electrical equipment: General requirements for basic safety and essential performance of medical devices. Periodical performance inspections were conducted according to legal metrology framework, more specifically according to Rules on metrological and technical requirements for infusion pumps, published in Official Gazette of Bosnia and Herzegovina (BH) No. 75/14. Our results show that approximately 9% of all tested infusion pumps do not meet electrical safety requirements or have performance outside the specifications. The causes of such faulty performance are environmental conditions, long period of usage of devices, faulty motors and device casing, as well as lack of systematic maintenance and regular safety and performance inspections in previous period. This paper addresses the importance of periodical performance inspections of these medical devices.

Keywords: *Infusion pumps, Performance, Inspection, Safety, Clinical engineering, Medical device*

TESTING OF DIALYSIS MACHINES IN HEALTHCARE INSTITUTIONS IN BOSNIA AND HERZEGOVINA

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Abstract

This paper presents the results of electrical safety and performance inspection of 500 dialysis machines conducted in public healthcare institutions in Bosnia and Herzegovina. All measurements were made by independent laboratory for inspection of medical devices appointed by National Metrology Institute of Bosnia and Herzegovina in accordance with national rules published in Official Gazette of Bosnia and Herzegovina No. 75/14. The results show that 12.6% of inspected devices do not meet electrical safety requirements or have performance outside the specifications. Specifically, 2% of tested devices did not pass the safety inspection in accordance with IEC 60601. Additionally, 11.32% of devices from this group had performance that was not in accordance to device specifications although malfunction was not reported. These results help to develop awareness among patients and medical personnel about safety and accuracy of devices used in treatment of disease as well as set the ground for planning the upgrade in dialysis departments in the healthcare institutions.

Keywords: *Dialysis machine, Performance, Inspection, Safety, Clinical engineering Medical device*

MACHINE LEARNING TECHNIQUES FOR CLASSIFICATION OF DIABETES AND CARDIOVASCULAR DISEASES

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Abstract

This paper presents the overview of machine learning techniques in classification of diabetes and cardiovascular diseases (CVD) using Artificial Neural Networks (ANNs) and Bayesian Networks (BNs). The comparative analysis was performed on selected papers that are published in the period from 2008 to 2017. The most commonly used type of ANN in selected papers is multilayer feedforward neural network with Levenberg-Marquardt learning algorithm. On the other hand, the most commonly used type of BN is Na'ive Bayesian network which shown the highest accuracy values for classification of diabetes and CVD, 99.51% and 97.92% retrospectively. Moreover, the calculation of mean accuracy of observed networks has shown better results using ANN, which indicates that higher possibility to obtain more accurate results in diabetes and/or CVD classification is when it is applied to ANN.

Keywords: *Machine Learning, Diabetes, Cardiovascular Disease, Artificial Neural Network, Bayesian Network*

PROPOSAL OF THE MONITORING AND EVALUATION APPROACH FOR COMMUNITY PUBLIC INFRASTRUCTURE IMPROVEMENT PROJECTS

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Abstract

Local governments in Bosnia and Herzegovina do not have clearly defined objective requirements or prescribed method for monitoring and evaluation of local public infrastructure projects. Decision making process in selection of infrastructure projects to be implemented is usually based upon an ad hoc basis or is driven by specific interest of different groups. However, effects on citizens' life quality of implemented projects are unknown, except clearly and obviously visible benefits, without any support in objective evaluation or analyses. This paper attempts to increase the awareness of necessity to introduce monitoring and evaluation principles in implementation of the infrastructure projects financed by public funds and shows that application of monitoring and evaluation principles is feasible and necessary for the implementation of such type of projects for their objective validation for achievements and results, as well as project selection, performance based decision making and project management issues. Using combination of tools, selection of quantitative and qualitative performance indicators, cross referenced by public opinion survey results, it is feasible to create an optimal monitoring and evaluation framework for monitoring of effects of implementation of any public infrastructure project. Such approach make the project implementer responsible, accountable, goal oriented and objective performance based decision maker. It also ensures maximization of results to be achieved by project implementation towards high expectations that have been earlier set up through analytical process. Such framework also assists in justification of project proposals to be implemented in initial stage to public and stakeholders, but also in evaluation of benefits and results after project completion and years to come.

Keywords: *Monitoring and Evaluation, Local Public Infrastructure, Local Public Facilities, City Planning*

PURIFICATION AND CHARACTERIZATION OF β - GLUCOSIDASE FROM BRASSICA OLERACEA

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Abstract

β -Glucosidase was purified from Brassica oleracea by salting out with ammonium sulfate and hydrophobic interaction chromatography. Results demonstrated that the enzyme is a dimer (130 kD) made up of one major (80 kD) and one minor subunit (50 kD). The pH optimum is 6.0, with 50% of the enzyme's original activity remaining between pH 4.0 and pH 7.0. The temperature optimum is 35C, and activity did not decrease after two hours of exposure to this temperature. The activity of the enzyme was investigated on four substrates, 4-Nitrophenyl β -D-glucopyranoside (p-NPG), ortho-Nitrophenyl- β -D-glucopyranoside (o-NPG), para-Nitrophenyl- β -D-galactoside (p-NPGal) and ortho-Nitrophenyl- β -D-galactoside (o-NPGal), and km values were shown to be 0.755 mM, 0.174 mM, 0.988 mM and 0.213 mM, while Vmax values were 604 U/mg, 38 U/mg, 556 U/mg and 308 U/mg, respectively. The enzyme is completely inhibited by gluconolactone and glucose against p-NPG as substrate, with ki values of 0.038 mM and 0.64 mM, respectively. To our knowledge, this is the first study demonstrating purification and characterization of β -glucosidase from broccoli, thus providing a better understanding of its role in the plant, and establishing a basis for further research.

META-ANALYSIS OF DEPLETED URANIUM LEVELS IN THE BALKAN REGION

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Abstract

In recent years, contradicting data has been published on the connection between the presence of depleted uranium and an increased cancer incidence among military personnel deployed in the Balkans during the 1992-1999 wars. This has led to numerous research articles investigating possible depleted uranium contamination of the afflicted regions of the Balkan Peninsula, namely Bosnia & Herzegovina, Serbia, Kosovo and Montenegro. The aim of this study was to collect data from previously published reports investigating the levels of depleted uranium in the Balkans and to present the data in the form of a meta-analysis. This would provide a clear image of the extent of depleted uranium contamination after the Balkan conflict. In addition, we tested the hypothesis that there is a correlation between the levels of depleted uranium and the assumed depleted uranium-related health effects. Our results suggest that the majority of the examined sites contain natural uranium, while the area of Kosovo appears to be most heavily afflicted by depleted uranium pollution, followed by Bosnia & Herzegovina. Furthermore, the results indicate that it is not possible to make a valid correlation between the health effects and depleted uranium-contaminated areas. We therefore suggest a structured collaborative plan of action where long-term monitoring of the residents of depleted uranium-afflicted areas would be performed. In conclusion, while the possibility of depleted uranium toxicity in post-conflict regions appears to exist, there currently exists no definitive proof of such effects, due to insufficient studies of

potentially afflicted populations, in addition to the lack of a common epidemiological approach in the reviewed literature.

Keywords: *Balkan conflicts, Depleted uranium, Environmental damage, Health effects, Radiation damage, Toxicity*

CHEMICAL TOXICITY AND RADIOACTIVITY OF DEPLETED URANIUM: THE EVIDENCE FROM IN VIVO AND IN VITRO STUDIES

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Abstract

The main aim of this review is to summarize and discuss the current state of knowledge on chemical toxicity and radioactivity of depleted uranium (DU) and their effect on living systems and cell lines. This was done by presenting a summary of previous investigations conducted on different mammalian body systems and cell cultures in terms of potential changes caused by either chemical toxicity or radioactivity of DU. In addition, the authors aimed to point out the limitations of those studies and possible future directions. The majority of both in vitro and in vivo studies performed using animal models regarding possible effects caused by acute or chronic DU exposure has been reviewed. Furthermore, exposure time and dose, DU particle solubility, and uranium isotopes as factors affecting the extent of DU effects have

been discussed. Special attention has been dedicated to chromosomal aberrations, DNA damage and DNA breaks, as well as micronuclei formation and epigenetic changes, as DU has recently been considered a possible causative factor of all these processes. Therefore, this approach might represent a novel area of study of DU-related irradiation effects on health. Since different studies offer contradictory results, the main aim of this review is to summarize and briefly discuss previously obtained results in order to identify the current opinion on DU toxicity and radioactivity effects in relation to exposure type and duration, as well as DU properties.

Keywords: *Chemical toxicity, Depleted uranium, Exposure, Radioactivity, in vivo and in vitro studies*

THE EFFECT OF LYSOZYME ON REDUCING BIOFILMS BY STAPHYLOCOCCUS AUREUS, PSEUDOMONAS AERUGINOSA, AND GARDNERELLA VAGINALIS: AN IN VITRO EXAMINATION

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Dženita Šeljmo

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Abstract

Two basic questions about lysozyme activities on the selected microorganisms were investigated, namely whether lysozyme inhibits biofilm production and which concentrations of the enzyme have the ability to change the natural biofilm producing capacity of different strains of Staphylococcus aureus (methicillin sensitive and resistant), Streptococcus pyogenes, Pseudomonas aeruginosa, and Gardnerella vaginalis. The effect of lysozyme on biofilm formation capacities of 16 strains of selected

microorganisms was investigated, whereby four testing replicates have been performed in vitro using the Test Tube method, and the potential of lysozyme to change biofilm forming capacities depending on its concentration, species, and strains of microorganisms is demonstrated. A lysozyme concentration of 30 µg/ml indicated to have the highest inhibiting effect on all tested microorganisms. Furthermore, G. vaginalis was the most sensitive of them all, as its biofilm formation was inhibited in the presence of as low as 2.5 µg/ml of lysozyme. At enzyme concentrations of 7.5-50 µg/ml (with the exception of 30 µg/ml) the biofilm forming capacities of P. aeruginosa were enhanced. Depending on the strain of P. aeruginosa, the total biofilm quantity was either reduced or unaffected at lysozyme concentrations of 2.5, 5, 7.5, and 30 µg/ml. In contrast, lysozyme concentrations below 15 or 20 µg/ml did not affect or increase the volume of biofilm formation, while higher concentrations (15, 20, 25 µg/ml) reduced biofilm formation by 50% (3/6) and 30 µg/ml of biofilm reduced biofilm forming capacity of S. aureus by 100% (6/6). The results of this study are a strong foundation for further research on lysozyme as a modulator of the biofilm forming capacity of different species with the potential to aid in the development of new drugs for the treatment of oral and vaginal infections.

Keywords: Antibacterial Agents, Antimicrobial Resistance, Biofilm, Lysozyme

A NOVEL SPECTROPHOTOMETRIC ASSAY FOR THE DETERMINATION OF BIOFILM FORMING CAPACITY OF CAUSATIVE AGENTS OF URINARY TRACT INFECTIONS

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Abstract

According to many studies today the biofilms play a crucial role in the clinical setting and are the cause of many difficult to treat and reoccurring infections. Recently their role in urinary tract infections (UTIs) is becoming very significant as they are known to cause relapses and reoccurring infections especially in patients with indwelling medical devices. Up to today many biofilm testing methodologies have been suggested, however, all of them have certain drawbacks and routine testing of the biofilm forming capacity of causative agents of infection is not conducted. In our study we developed a novel spectrophotometric assay for the evaluation of the biofilm forming capacity of causative agents of UTIs and tested it on 120 urine samples isolated from two medical centers in Mostar, Bosnia and Herzegovina. The results of the novel spectrophotometric assay were then compared to the results obtained by the tissue culture plate method which was used as a referee. Based on statistical data the sensitivity and specificity of the novel spectrophotometric assay was evaluated to be 95% which is adequate for the use in standard clinical microbiology laboratories for the determination of the biofilm forming capacity of causative agents of UTI.

HETEROLEPTIC RUTHENIUM BIOFLAVONOID COMPLEXES: FROM SYNTHESIS TO IN VITRO BIOLOGICAL ACTIVITY

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Abstract

Heteroleptic ruthenium(II) bioflavonoid complexes of quercetin, morin, chrysin, and 3-hydroxyflavone were prepared and their interaction with CT DNA and BSA along with antioxidant and in vitro anticancer and antimicrobial activities was investigated. The formulation and characterization of complexes were achieved through elemental and thermal analysis, mass spectrometry, ¹H NMR spectroscopy along with infrared, electronic absorption, and emission spectroscopy as well as square-wave voltammetry, and

magnetic and conductivity measurements. Ruthenium(II) is octahedrally coordinated in cationic complex species to two bidentate diimine ligands (2,2'-bipyridine or 1,10-phenanthroline) and one bidentate monobasic flavonoid ligand through 3,4-site of quercetin, morin, and 3-hydroxyflavone or 4,5-site of chrysin. Complexes bind CT DNA by intercalation and binding constants comparable to ethidium bromide or 10 times higher. Binding constants of complexes to BSA were several times higher compared to ibuprofen and diazepam, and suggest that the complexes have a strong affinity to BSA. Antioxidant activity tests showed that the complexes are more potent in terms of radical inhibition compared to the parent flavonoids. Cytotoxic testing revealed that the Ru(II) complex of quercetin with 2,2'-bipyridine co-ligand has good selectivity to breast adenocarcinoma, while the complex of 3-hydroxyflavone with 2,2'-bipyridine co-ligand showed strong cytotoxicity toward all tested cell lines with $IC_{50} \sim 1 \mu M$. All complexes showed moderate activity toward *Acinetobacter baumannii*, while the Ru(II) complex of 3-hydroxyflavone with 2,2'-bipyridine showed excellent activity toward MRSA and *Candida albicans*.

Keywords: Ruthenium, Flavonoid, Biomolecules, Anticancer, Antimicrobial

T-LYMPHOCYTE SUBSETS AS A PROGNOSTIC FACTOR IN A CLINICAL COURSE OF CHICKENPOX

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Abstract

OBJECTIVE:

To investigate possible prognostic values of CD4+, CD8+ T-lymphocytes, CD4/CD8 ratio to clinical course of chickenpox in immunocompetent hosts.

MATERIALS AND METHODS:

We performed a prospective study which included 69 immunocompetent patients with chickenpox who were admitted to Clinic for infectious disease, Clinical Center University of Sarajevo, in a 18 month period. All patients were divided into two groups depending on clinical presentation on admission. Patients with mild clinical form were dedicated to "outpatient" group, and patients with moderate, severe or life-threatening clinical forms were dedicated to "hospitalized" group. Also 30 healthy volunteers are included in study as a control group. We analyzed values of CD4+, CD8+ percentage, CD4/CD8 ratio with comparison to clinical course of chickenpox. All specimens were taken in acute phase of illness.

RESULTS:

Values of CD4+ percentage were significantly declined in a group of hospitalized patients, compared to group of outpatients and control group. Values of CD8+ percentage were higher in a group of hospitalized patients, while CD4/CD8 values were lower in comparison to a group of outpatients and control group.

CONCLUSION: We found significant correlation between these parameters and clinical course of chickenpox.

Keywords: *Chickenpox; T-lymphocyte; prognostic factors*

A FUZZY MODEL TO PREDICT RISK OF URINARY TRACT INFECTION

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Abstract

Urinary tract infections (UTIs) are among the most common bacterial infections and account for a significant part of the workload in clinical microbiology laboratories. Hence, urine is the specimen most frequently submitted for culture. Physicians distinguish UTIs from other diseases that have similar clinical presentations with use of a small number of tests to distinguish bacteriuria. The microbiological examination of urine consists of examining a methylene smear of the urine specimen, a screening test of significant bacteriuria and culture. In the smear one or more bacterial cells per oil-immersion field usually implies that there are 10⁵ or more bacteria per milliliter in the specimen, the number of RBC and WBC is also a very important indicator. In literature, the normal ranges of these variables are differently defined. The analysis of this data could be very simplified using data management systems. Fuzzy logic, in a narrow sense, is a logical system, which is an extension of multivalued logic. The fuzzy logic works on a theory which relates to classes of objects with blurred boundaries in which membership is a matter of degree. This enables fuzzy systems applicable to broad

range of parameters and expected output values in many aspects of science. The aim of this study was to create a fuzzy model, in the MATLAB environment, to aid physicians in interpreting the results of the microscopic urine analysis, considering the number of bacteria, RBC and WBC as well as turbidity of the sample.

Keywords: *Fuzzy logic, MATLAB, UTI, Microscope Examination of Urine*

A NOVEL SPECTROPHOTOMETRIC ASSAY FOR THE DETERMINATION OF BIOFILM FORMING CAPACITY OF CAUSATIVE AGENTS OF URINARY TRACT INFECTIONS

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Abstract

According to many studies today the biofilms play a crucial role in the clinical setting and are the cause of many difficult to treat and reoccurring infections. Recently their role in urinary tract infections (UTIs) is becoming very significant as they are known to cause relapses and reoccurring infections especially in patients with indwelling medical devices. Up to today many biofilm testing methodologies have been suggested, however, all of them have certain drawbacks and routine testing of the biofilm forming capacity of causative agents of infection is not conducted. In our study we developed a novel spectrophotometric assay for the evaluation of the biofilm forming capacity of causative agents of UTIs and tested it on 120 urine samples isolated from two medical centers in Mostar, Bosnia and Herzegovina. The results of the novel spectrophotometric assay were then compared to the results obtained by the tissue culture plate method which was used as a referee. Based on statistical data the sensitivity and specificity of the novel spectrophotometric assay was evaluated to be 95% which is adequate for the use in standard clinical microbiology laboratories for the determination of the biofilm forming capacity of causative agents of UTI.

RECOGNIZING THE POSSIBILITY OF BIOTERRORISM IN THE FACE OF EMERGING AND REEMERGING ZONOTIC PATHOGENS IN BOSNIA AND HERZEGOVINA DURING THE WAR (1992-1995)

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Abstract

Tularemia is a vector-borne zoonosis with a complex epidemiology caused by Francisella tularensis. F. tularensis is a non-motile, obligatory aerobic, facultative intracellular Gram-negative coccobacillus. The bacterium has a broad host range, i.e. mammals, birds and invertebrates. Two types (A, B) and four subspecies (F. tularensis subsp. tularensis (type A), F. tularensis subsp. holarctica (type B), F. tularensis

subsp. mediasiatica and F. tularensis subsp. novicida.) are known today. Types A and B are of importance as they cause disease in humans and animals. Type A is present almost exclusively in North America and type B is found all over the Northern hemisphere. F. tularensis is considered to be a class A biological warfare agent, it is notoriously difficult to recognize infections in non-endemic regions and was produced as a weaponized agent by several countries in the 1960ties and 70ties. Humans can acquire tularemia by inhaling dust or aerosols contaminated with F. tularensis bacteria, this type of exposure can result in pneumonic tularemia, one of the most severe forms of the disease. especially farming involving machines that disperse remains of infected animals or carcasses. Rarely, water can become tularemia contaminated through contact with infected animals. Humans who drink contaminated and untreated water may contract oropharyngeal tularemia. The tularemia outbreak in B&H in 1995 showed an unusual number of oropharyngeal cases. As all aspects of this particular tularemia epidemic were not thoroughly investigated and the possible intentional use of agents of biological warfare remained a possibility, we reviewed all available data in order to assess whether the outbreak was natural.

CLINICAL SIGNIFICANCE OF CONVENTIONAL KARYOTYPE AND QF-PCR IN DETECTION OF FETAL CHROMOSOMAL ABNORMALITIES

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Abstract

This study aims to compare the advantages of two widely used methods for fetal chromosomal detection, karyotyping and QF-PCR, together with the indications for invasive prenatal diagnosis. We retrospectively investigated 888 amniocenteses analyzed by karyotyping only or karyotyping combined with QF-PCR. We assessed the results of each method and compared them to the indications for prenatal testing including maternal age, fetal ultrasound findings, and serum screening. We found 39 (4.4%) abnormalities, where 59% of those abnormalities were numerical and 41% were structural abnormalities undetectable by QF-PCR methods. Many structural abnormalities do not have clinical significance and we found that 23% of found structural abnormalities were clinically significant but undetectable by QF-PCR (0.3% of all amniocentesis analyzed). Additional 23% of found structural abnormalities were balanced translocations which can have rare clinically significant consequences. In total, 46% of found structural abnormalities had possible clinical consequences, which were undetectable by QF-PCR, or by noninvasive prenatal testing for five common aneuploidies. Thus, QF-PCR is a reliable method to detect most common fetal aneuploidies, but karyotyping should be used if any other chromosomal abnormalities are suspected. Even though QF-PCR is a fast and reliable method, physicians should be aware of the limitations of various methodologies for detection of fetal abnormalities and assign the proper method to the indication for amniocentesis.

Keywords: Karyotype, QF-PCR, Fetal abnormalities, Trisomy 21

SURVEY OF LABORATORY-ACQUIRED INFECTIONS AROUND THE WORLD IN BIOSAFETY LEVEL 3 AND 4 LABORATORIES

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Abstract

Laboratory-acquired infections due to a variety of bacteria, viruses, parasites, and fungi have been described over the last century, and laboratory workers are at risk of exposure to these infectious agents. However, reporting laboratory-associated infections has been largely voluntary, and there is no way to determine the real number of people involved or to know the precise risks for workers. In this study, an international survey based on volunteering was conducted in biosafety level 3 and 4 laboratories to determine the number of laboratory-acquired infections and the possible underlying causes of these contaminations. The analysis of the survey reveals that laboratory-acquired infections have been infrequent and even rare in recent years, and human errors represent a very high percentage of the cases. Today, most risks from biological hazards can be reduced through the use of appropriate procedures and techniques, containment devices and facilities, and the training of personnel.

CHARACTERISTICS OF VANCOMYCIN-RESISTANT ENTEROCOCCUS STRAINS IN THE WEST BALKANS: A FIRST REPORT

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Abstract

Vancomycin-resistant enterococci are among the major causes of nosocomial infections and represent a growing problem in many European countries. Among the most common enterococcal isolates, Enterococcus faecium is considered to be the reservoir of VanA and VanB-mediated resistance to glycopeptides. Enterococci with VanA-mediated resistance can transfer resistance genes to other enterococci and gram-positive bacteria. Hence, monitoring and surveillance of vancomycin-resistant enterococci (VREs) are crucial for the prevention of the spread of glycopeptide resistance. No reports have yet been published that document the resistance rates and typization of VREs in the region of Bosnia and Herzegovina as well as Croatia. In this study, 64 clinical enterococcal strains that were isolated in clinical centers, Mostar, Sarajevo, and Zagreb, were studied and findings regarding characteristics of vancomycin-resistant strains found in the West Balkan region are reported for the first time. All of the strains were identified using conventional phenotypic methods, and the resistance to glycopeptides was determined using the disk diffusion method, Vitek 2, and genotypic Enterococcus

assay. The results of genotyping showed that 40 strains were identified as VREs (30% Enterococcus faecalis and 70% E. faecium), while the sensitivity of the phenotypic methods was 87.5%. Furthermore, VanA and VanB resistance types were found in Bosnia and Herzegovina and Croatia, with slightly higher prevalence of the latter (72.5%) over the former (27.5%).

**PREDICTION OF THE Y-CHROMOSOME HAPLOGROUPS WITHIN A
RECENTLY SETTLED TURKISH POPULATION IN SARAJEVO, BOSNIA AND
HERZEGOVINA**

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Abstract

Analysis of Y-chromosome haplogroup distribution is widely used when investigating geographical clustering of different populations, which is why it plays an important role in population genetics, human migration patterns and even in forensic investigations. Individual determination of these haplogroups is mostly based on the analysis of single nucleotide polymorphism (SNP) markers located in the non-recombining part of Y-chromosome (NRY). On the other hand, the number of forensic and anthropology studies investigating short tandem repeats on the Y-chromosome (Y-STRs) increases rapidly every year. During the last few years, these markers have been successfully used as haplogroup prediction methods, which is why they have been used in this study. Previously obtained Y-STR haplotypes (23 loci) from 100 unrelated Turkish males recently settled in Sarajevo were used for the determination of haplogroups via 'Whit Athey's Haplogroup Predictor' software. The Bayesian probability of 90 of the studied haplotypes is greater than 92.2% and ranges from 51.4% to 84.3% for the remaining 10 haplotypes. A distribution of 17 different haplogroups was found, with the Y-haplogroup J2a being most prevalent, having been found in 26% of all the samples, whereas R1b, G2a and R1a were less prevalent, covering a range of 10% to 15% of all the samples. Together, these four haplogroups account for 63% of all Y-chromosomes. Eleven haplogroups (E1b1b, G1, I1, I2a, I2b, J1, J2b, L, Q, R2, and T) range from 2% to 5%, while E1b1a and N are found in 1% of all samples. Obtained results indicate that a large majority of the Turkish paternal line belongs to West Asia, Europe Caucasus, Western Europe, Northeast Europe, Middle East, Russia, Anatolia, and Black Sea Y-chromosome lineages. As the distribution of Y-chromosome haplogroups is consistent with the previously published data for the Turkish population residing in Turkey, it was concluded that the analyzed population could also be recognized as a representative sample of the Turkish population residing in Turkey.

ANTIBIOTIC RESISTANCE PROFILES AND GENETIC SIMILARITIES WITHIN A NEW GENERATION OF CARBAPENEM-RESISTANT ACINETOBACTER CALCOACETICUS-A. BAUMANNII COMPLEX RESISTOTYPES IN BOSNIA AND HERZEGOVINA

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Abstract

Acinetobacter calcoaceticus-A. baumannii complex (ACB complex) is a nosocomial pathogen. Due to its high ability to develop antibiotic resistance, it has become a problematic challenge in the modern healthcare system. The molecular and genetic mechanisms of gaining multidrug resistance in ACB complex are well known. This study focuses on providing an overview of the antibiotic resistance profiles, genetic similarities and resistotypes, and general characteristics of carbapenem-resistant ACB complex (CRACB) in Bosnia and Herzegovina (BiH). In light of the data collected in this study, together with the already known information concerning antibiotic resistance of ACB complex, we intend to further elucidate the antibiotic therapy for CRACB strain resistotypes in BiH.

EPIDEMIOLOGIC AND LABORATORY SURVEILLANCE OF THE MEASLES OUTBREAK IN THE FEDERATION OF BOSNIA AND HERZEGOVINA

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Abstract

A measles outbreak with two epidemic waves involving 4649 probable and laboratory-confirmed cases was recorded in six out of ten cantons of the Federation of Bosnia and Herzegovina between February 2014 and April 2015. The majority of the patients had never received measles vaccination (3115/4649, 67.00%) and the vaccination status of another 23% was unknown (1066/4649). A total of 281 blood samples were tested serologically. Virus detection was performed using 44 nasopharyngeal swabs. About 57% (161/281) of the laboratory investigated serawere IgM positive and 95% (42/44) of the swabs were RT-PCR positive. Phylogenetic analysis of sequences obtained from 30 swab samples showed circulation of two variants of genotype D8, but no genotype D4 strains as detected in 2007. Similar involvement of all age groups indicates a problem with vaccine refusal due to anti-vaccination activities in addition to gaps in immunization coverage during the war and post-war period (1992-1998). Differences in ethnicity, vaccine coverage, compliance with review policies of vaccination records and potentially also travel habits may partially explain why only six of ten cantons were affected by the

outbreak. The second epidemic wave may in part be due to large-scale migrations due to catastrophic floods in 2014. As a result of the epidemic, 6-12 months old children may now be vaccinated against measles during outbreaks and public health recommendations for interventions have been strengthened. Additional efforts are required to implement the measures throughout the cantons.

DETECTION OF PUUMALA VIRUS IN THE TISSUE OF INFECTED NATURALLY RODENT HOSTS IN THE AREA OF CENTRAL DINARIDES

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Abstract

*Hantaviruses are the causative agents of haemorrhagic fever with renal syndrome (HFRS) in Euroasia and of hantavirus cardiopulmonary syndrome (HCPS) in the North, Central and South America. HFRS is endemic in the Balkan Peninsula, where sporadic cases or outbreaks have been reported. Puumala virus (PUUV) is the causative agent of nephropathia epidemica (NE), a mild form of HFRS. PUUV is carried by the bank voles (*Myodes glareolus*). In this study, we investigated viral RNA from 76 tissues samples (lung n = 30, heart n = 6, liver n = 18 and kidney n = 22) of infected natural rodent hosts in the area of Central Dinarides caught in live traps. Puumala virus was extracted from 34,7% (16/46) rodents by nested reverse transcriptase polymerase chain reaction (RT-PCR) and real-time RT-PCR. Overall, 18 (21,4%) specimens of internal organs (kidney n = 8, liver n = 6, heart n = 2 and lung n = 2) were positive for PUUV. It was shown a high rodent infestation rate in a relatively low number of rodent and their organs, although mice were not caught during the time of high density population of host rodents.*

GENOMIC ANALYSES INFORM ON MIGRATION EVENTS DURING THE PEOPLING OF EURASIA

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Abstract

High-coverage whole-genome sequence studies have so far focused on a limited number of geographically restricted populations, or been targeted at specific diseases, such as cancer. Nevertheless, the availability of high-resolution genomic data has led to the development of new methodologies for inferring population history and refuelled the debate on the mutation rate in humans. Here we present the Estonian Biocentre Human Genome Diversity Panel (EGDP), a dataset of 483 high-coverage human genomes from 148 populations worldwide, including 379 new genomes from 125 populations, which we group into diversity and selection sets. We analyse this dataset to refine estimates of continent-wide patterns of heterozygosity, long- and short-distance gene flow, archaic admixture, and changes in effective population size through time as well as for signals of positive or balancing selection. We find a genetic signature in present-day Papuans that suggests that at least 2% of their genome originates from an early and largely extinct expansion of anatomically modern humans (AMHs) out of Africa. Together with evidence from the western Asian fossil record, and admixture between AMHs and Neanderthals predating the main Eurasian expansion, our results contribute to the mounting evidence for the presence of AMHs out of Africa earlier than 75,000 years ago.

MOLECULAR DIVERSITY OF 23 Y-CHROMOSOME SHORT TANDEM REPEAT LOCI IN THE POPULATION OF TUZLA CANTON

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Abstract

Background:

Tuzla Canton is the most populated region in the ethnically mixed territory of Bosnia and Herzegovina, whose genetic analysis could provide an insight into past demographic events.

Aim:

Analysis of 23 Y-chromosome STR markers in the population of Tuzla Canton and investigation of the genetic relationship of the male population of the Tuzla Canton and that of the larger Bosnian and Herzegovinian population as well as neighbouring and other European populations.

Subjects and methods:

The study was conducted among 100 unrelated healthy adult males from Tuzla Canton that have been genotyped using 23 Y-STR loci included in the PowerPlex Y23 kit. Statistical parameters such as haplotype diversity and allele frequencies were calculated, as well as the Rst-based genetic distances between the new dataset and those from Bosnia and Herzegovina and elsewhere, which were then visualised through multidimensional scaling plot and neighbour-joining phylogenetic tree analyses.

Results:

PowerPlex Y23 kit has shown high discrimination capacity, as all 100 individuals have unique haplotypes. The newly incorporated loci seem to be highly informative. Population comparison reveals no statistically significant differences between the study population and the general Bosnian-Herzegovinian population, and between the study population and neighbouring populations.

Conclusion:

Results could be used as an additional investigation of the genetic relationship between the regional populations in Bosnia and Herzegovina and neighbouring human populations, as well as for further human population and forensic genetics studies.

Y-CHROMOSOMAL HAPLOGROUP DISTRIBUTION IN THE TUZLA CANTON OF BOSNIA AND HERZEGOVINA: A CONCORDANCE STUDY USING FOUR DIFFERENT IN SILICO ASSIGNMENT ALGORITHMS BASED ON Y-STR DATA

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Abstract

Y-chromosomal haplogroups are sets of ancestrally related paternal lineages, traditionally assigned by the use of Y-chromosomal single nucleotide polymorphism (Y-SNP) markers. An increasingly popular and a less labor-intensive alternative approach has been Y-chromosomal haplogroup assignment based on already available Y-STR data using a variety of different algorithms. In the present study, such in silico haplogroup assignments were made based on 23-loci Y-STR data for 100 unrelated male individuals from the Tuzla Canton, Bosnia and Herzegovina (B&H) using the following four different algorithms: Whit Athey's Haplogroup Predictor, Jim Cullen's World Haplogroup & Haplogroup-I Subclade Predictor, Vadim Urasin's YPredictor and the NevGen Y-DNA Haplogroup Predictor. Prior in-house assessment of these four different algorithms using a previously published dataset (n = 132) from B&H with both Y-STR (12-loci) and Y-SNP data suggested haplogroup misassignment rates between 0.76% and 3.02%. Subsequent analyses with the Tuzla Canton population sample revealed only a few differences in the individual haplogroup assignments when using different algorithms. Nevertheless, the resultant Y-chromosomal haplogroup distribution by each method was very similar, where the most

prevalent haplogroups observed were I, R and E with their sublineages I2a, R1a and E1b1b, respectively, which is also in accordance with the previously published Y-SNP data for the B&H population. In conclusion, results presented herein not only constitute a concordance study on the four most popular haplogroup assignment algorithms, but they also give a deeper insight into the inter-population differentiation in B&H on the basis of Y haplogroups for the first time.

DNA IDENTIFICATION OF COMMINGLED HUMAN REMAINS FROM THE CEMETERY RELOCATED BY FLOODING IN CENTRAL BOSNIA AND HERZEGOVINA

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Abstract

The floods in Bosnia and Herzegovina in May 2014 caused landslides all over the country. In the small village of Šerići, near the town of Zenica, a landslide destroyed the local cemetery, relocated graves, and commingled skeletal remains. As the use of other physical methods of identification (facial recognition, fingerprint analysis, dental analysis, etc.) was not possible, DNA analysis was applied. DNA was isolated from 20 skeletal remains (bone and tooth samples) and six reference samples (blood from living relatives) and amplified using PowerPlex® Fusion and PowerPlex® Y23 kits. DNA profiles were generated for all reference samples and 17 skeletal remains. A statistical analysis (calculation of paternity, maternity, and sibling indexes and matching probabilities) resulted in 10 positive identifications. In this study, 5 individuals were identified based on one reference sample. This has once again demonstrated the significance of DNA analysis in resolving the most complicated cases, such as the identification of commingled human skeletal remains.

Keywords: DNA identification, Floods, Forensic science, Landslides, Skeletal remains

Y CHROMOSOME HAPLOGROUPS IN THE BOSNIAN-HERZEGOVINIAN POPULATION BASED ON 23 Y-STR LOCI

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Abstract

In a study of the Bosnian-Herzegovinian (B&H) population, Y-chromosome marker frequencies for 100 individuals, generated using the PowerPlex Y23 kit, were used to perform Y-chromosome haplogroup assignment via Whit Athey's Haplogroup Predictor. This algorithm determines Y-chromosome haplogroups from Y-chromosome short tandem repeat (Y-STR) data using a Bayesian probability-based approach. The most frequent haplogroup appeared to be I2a, with a prevalence of 49%, followed by R1a and E1b1b, each accounting for 17% of all haplogroups within the population. Remaining haplogroups were J2a (5%), I1 (4%), R1b (4%), J2b (2%), G2a (1%), and N (1%). These results confirm previously published preliminary B&H population data published over 10 years ago, especially the prediction about the B&H population being a part of the Western Balkan area, which served as the Last Glacial Maximum refuge for the Paleolithic human European population. Furthermore, the results corroborate the hypothesis that this area was a significant stopping point on the "Middle East-Europe

highway" during the Neolithic farmer migrations. Finally, since these results are almost completely in accordance with previously published data on B&H and neighboring populations generated by Y-chromosome single nucleotide polymorphism analysis, it can be concluded that in silico analysis of Y-STRs is a reliable method for approximation of the Y-chromosome haplogroup diversity of an examined population.

Keywords: *Bosnian-Herzegovinian population, Whit athey's haplogroup predictor, Y chromosome, Y haplogroups, Y-strs*

ALLELE FREQUENCIES OF 15 STR LOI IN BOSNIA AND HERZEGOVINA

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Abstract

Aim

To determine newest the most accurate allele frequencies for 15 short tandem repeat (STR) loci in the Bosnian and Herzegovinian population, calculate statistical parameters, and compare them with the relevant data for seven neighboring populations.

Methods

Genomic DNA was obtained from buccal swabs of 1000 unrelated individuals from all regions of Bosnia and Herzegovina. Genotyping was performed using PowerPlex® 16 System to obtain allele frequencies for 15 polymorphic STR loci including D3S1358, TH01, D21S11, D18S51, Penta E, D5S818, D13S317, D7S820, D16S539, CSF1PO, Penta D, vWA, D8S1179, TPOX, and FGA. The calculated allele frequencies were also compared with the data from neighboring populations.

Results

The highest detected value of polymorphism information content (PIC) was detected at the PentaE locus, whereas the lowest value was detected at the TPOX locus. The power of discrimination (PD) values had similar distribution, with Penta E showing the highest PD of 0.9788. While D18S51 had the highest value of power of exclusion (PE), the lowest PE value was detected at the TPOX locus.

Conclusion

Upon comparison of Bosnian and Herzegovinian population data with those of seven neighboring populations, the highest allele frequency differentiation was noticed between Bosnian and Herzegovinian and Turkish population at 5 loci, the most informative of which was Penta E. The neighbor-joining dendrogram constructed on the basis of genetic distance showed grouping of Slovenian, Austrian, Hungarian, and Croatian populations. Bosnian and Herzegovinian population was between the mentioned cluster and Serbian population. To determine more accurate distribution of allelic frequencies and forensic parameters, our study included 1000 unrelated individuals from all regions of Bosnia and Herzegovina, and our findings demonstrated the applicability of these markers in both forensics and future population genetic studies.

AN EXAMINATION OF GROWTH ACCELERATION TRENDS WITHIN A MALE POPULATION IN BOSNIA AND HERZEGOVINA BETWEEN THE 19TH AND 21ST CENTURIES

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Abstract

In a transversal study that was conducted from October 2014 to March 2015, we analysed anthropometric measurements and height of young adults. The study included a cohort of 1010 individuals, 596 females and 416 males, who were born during the war period in Bosnia and Herzegovina (BH) (1992-1995) and were in an age range of 20-24. The average measured height of females was 167.37 ± 6.00 cm and 182.77 ± 6.57 cm of males. When these data were compared with measurements taken in 1895 of Bosnian soldiers who served in the Austro-Hungarian army (age 20 to 24), whose average height was 172.35 ± 5.54 cm, a difference of $t=31.17$ was observed ($p < 0.001$). Our data showed that the average height of men born from 1992 to 1995 was 182.77 ± 6.56 cm. Furthermore, additional international comparisons with other European and European-descent nations showed that our studied population was one of the tallest. Based on the aforementioned it can be concluded that anthropometric attributes in BH follow a trend of acceleration, which is of particular significance for this part of the world as this anthropometric acceleration trend was observed in a cohort that was born and raised in sub-optimal conditions of war that lasted from 1992 to 1995. It is, therefore, safe to assume that, despite hardships, living conditions have overall improved over a period of 100 years as an increase in overall body height was observed.

MOLECULAR MECHANISMS OF POSTTRAUMATIC STRESS DISORDER (PTSD) AS A BASIS FOR INDIVIDUALIZED AND PERSONALIZED THERAPY: RATIONALE, DESIGN AND METHODS OF THE SOUTH EASTERN EUROPE (SEE)-PTSD STUDY

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Abstract

Posttraumatic Stress Disorder (PTSD) is a major health problem in South Eastern Europe (SEE). Available treatment options are not efficient enough and the course is often chronic. Little is known about molecular mediators and moderators of pathogenesis and therapy. Genetic and epigenetic variation may be one central molecular mechanism. We therefore established a consortium combining clinical expertise on PTSD from SEE countries Bosnia-Herzegovina (Sarajevo, Tuzla and Mostar), Kosovo (Prishtina) and Croatia (Zagreb) with genetic and epigenetic competence from Germany (Würzburg) in 2011 within the framework of the DAAD (Deutscher Akademischer Austauschdienst)-funded Stability Pact for South Eastern Europe. After obtaining ethical votes and performing rater trainings as well as training in DNA extraction from EDTA blood between 2011 and 2013, we recruited 747 individuals who had experienced war-related trauma in the SEE conflicts between 1991 and 1999. 236 participants had current PTSD, 161 lifetime PTSD and 350 did not have and never had PTSD. Demographic and clinical data are currently merged together with genetic and epigenetic data in a single database to allow for a comprehensive analysis of the role of genetic and epigenetic variation in the pathogenesis and therapy of PTSD. Analyses will be done to a great degree by PhD students from participating SEE centers who in addition to participation in the project had an opportunity to take part in spring and summer schools of the DFG (Deutsche Forschungsgemeinschaft) funded Research Training Group (RTG) 1253 and thus meet PhD students from Germany and other countries We are confident that our project will not only contribute to a better understanding of genetic and epigenetic mechanisms of PTSD as a basis for future individualized and personalized therapies, but also to the academic development of South Eastern Europe.

DETECTION OF CYTOSINE AND CPG DENSITY IN PROTO-ONCOGENES AND TUMOR SUPPRESSOR GENES IN PROMOTER SEQUENCES OF ACUTE MYELOID LEUKEMIA

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Abstract

Aberrant methylation is one of the driving forces of cancer genome development. Although the rate of methylation appears massively variable across the genome, it is mainly observed in histone modification, chromatin organization, DNA accessibility, or promoter sequence. Methylation of promoter sequence occurs mostly to cytosine nucleotides, which can affect transcription factors' binding affinities. In this study, we demonstrated that cytosine repeats (C types density), consisting of CC, CCC, CCCC, CCCCC, CCCCCC, CCCCCC motifs and CpG islands density in 25 proto-oncogenes, tumor suppressor genes and control genes may play a role in the pathogenesis of acute myeloid leukemia. The promoter sequences were divided into a 100 nucleotide window from -500 to +100 nucleotides and 20 nucleotide window from -100 to +100. Each window is analyzed to find the higher C type and CpG islands density, which may cause the increased methylation in the promoter sequence. Our novel findings show that promoter sequence cytosine repeats and CpG density increase closer to transcription sites, especially just before and after the transcription start site (TSS). The results demonstrate that cytosine density increases while proto-oncogenes and TSG promoter sequences are closer to TSS 50.8% and 41.0% respectively, if (-500 to -200) and (-100 to +100) windows of the nucleotide sequences are compared. This proves that around TSS location has special nucleotide motifs and could be an important implication for our understanding of potential methylating locations in promoters.

Keywords: CpG island; Cytosine density; methylation of cytosine locations; nucleic acid structures of promoter sequences

PREVALENCE OF F5 1691G> A, F2 20210G> A, AND MTHFR 677C> T POLYMORPHISMS IN BOSNIAN WOMEN WITH PREGNANCY LOSS

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Abstract

The relationship between genetic risk factors of thrombophilia and pregnancy loss (PL) is being discussed. The focus has been on F5 1691G>A, F2 20210G>A, and MTHFR 677C>T polymorphisms that may predispose women to microthrombosis during the stages of embryo implantation and placentation. Although, the frequencies of these polymorphisms were reported in different populations, such studies have not yet been performed in Bosnian population. In this study, we determined the prevalence of F5 G>A (rs6025), F2 G>A (rs1799963) and MTHFR C>T (rs1801133) polymorphisms in Bosnian women. A total of 154 women with PL, mean age 33 (±5.4) years, were enrolled in the study. As a control group, 154 mothers [mean age 31.4 (±6.7) years] with at least one live-born child were included. We used real-time polymerase chain reaction (PCR) to determine the frequencies of F5 G>A and F2 G>A genotypes, and PCR-restriction fragment length polymorphism (RFLP) for analyzing MTHFR C>T genotypes. The frequency of heterozygotes for F5 and F2 was significantly higher in women with venous thrombosis (VT) compared to women without VT ($p = 0.047$ and $p = 0.001$, respectively). There was no significant difference in the distribution of MTHFR genotypes and alleles between these two groups. In addition, we observed no significant differences in the genotype and allele frequencies between the group with PL and control group, for all investigated polymorphisms. The allele frequencies for 1691A (F5), 20210A (F2), and 677T (MTHFR) reported in this study are consistent with the data obtained for other European countries, however, we were not able to confirm the association between the three polymorphisms and PL in Bosnian women.

**DIVERSITY OF Y-CHROMOSOMAL AND MTDNA IVERSITY OF Y-
CHROMOSOMAL AND MTDNA MARKERS INCLUDED IN MEDISCOPE CHIP
WITHIN ARKERS INCLUDED IN MEDISCOPE CHIP WITHIN TWO ALBANIAN
SUBPOPULATIONS FROM CROATIA WO ALBANIAN SUBPOPULATIONS
FROM CROATIA AND KOSOVO: PRELIMINARY DATA AND KOSOVO:
PRELIMINARY DATA**

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Abstract

The aim of this preliminary study is to analyze genetic specificity of Kosovo Albanians comparing with neighboring populations using new genetic tool – MEDISCOPE gene chip, to investigate the feasibility of this approach. We collected 37 DNA samples (9 Croats, 17 Albanians from Croatia and 11 Albanians from Kosovo) from unrelated males born in Croatia and Kosovo. Additionally, samples were expanded with female individuals and mtDNA analysis included a total of 61 samples (15 Croats, 23 Albanians from Croatia and 23 Albanians from Kosovo). This pilot study suggests that the usage of the MEDISCOPE chip could be recognized as an efficient tool within recognition of the population genetic specificity even within extremely small sample size.

Keywords: Y-chromosome, mtDNA, haplogroup, MEDISCOPE Chip, Albanian, Croatia, Kosovo

CHANGES IN BLOOD PRESSURE AND HEART RATE MEASUREMENT UNDERGRADUATE STUDENTS DURING EXAM PERIOD

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Abstract

Stress is a part of human life, especially for urban citizens. Stress is inseparable characteristics of student life, especially exam days. Stress management is one of the first steps which can affect students success during the exams, especially in universities. Blood pressure is the first stress observation symptom to understand its level. Therefore, to understand the stress impact of university students during the exam weeks, a conditional experiment has been designed. 200 students were selected from Bosnian and Turkish female and male. The students` blood systolic, diastolic and heart rate were measured to detect the differences between non-exams days and exam days. The blood pressure measurement has been

done 3 times in specific times, non-exam days, midterm and final days. Since non-exam days were taken as stress off days, they were supposed that these days were control data to compare with exam days to see the differences. As a result of the measurements, Bosnian females showed the highest increasing, systolic 13.2%, diastolic 9.3% and heart rate 8.5% during the midterm exam days. The group has been followed by Bosnian males, systolic 6.9%, diastolic 6.1% and heart rate 6.63 increased during the midterm days. Although Turkish students blood pressure and heart rate increased, the values were less than Bosnian students. Moreover, high correlation significance results belonged to Bosnian females and males, 0.722 and 0.698 respectively. Finally, it was concluded that if students have scholarship they have more blood pressure during the exams. While 95% of Bosnian females and 90% of Bosnian males have some scholarship, no Turkish students have scholarship demonstrated the differences between Bosnian and Turkish students blood measurements.

Keywords: *Blood pressure, Stress, Bosnian females and males, Statistical observations*

DIAGNOSTIC OF ASTHMA USING FUZZY RULES IMPLEMENTED IN ACCORDANCE WITH INTERNATIONAL GUIDELINES AND PHYSICIANS EXPERIENCE

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Abstract

This paper presents a system for classification of asthma based on fuzzy rules. Fuzzy rules are defined according to Global Initiative for Asthma (GINA) guidelines, as well as through consultations with long-term experience of pulmonologists. Our fuzzy system for classification of asthma is based on a combination of spirometry (SPIR) and Impulse Oscillometry System (IOS) test results, which are inputs to fuzzy system. Additionally, the use of bronchodilatation and bronhoprovoation enabled a complete patient's dynamic assessment rather than a simple static assessment. The system was retroactively tested with 1250 Medical Reports established by pulmonologists, out of which 728 were diagnosed with asthma and 522 were healthy subjects. Sensitivity and specificity were assessed, on this dataset, which were 91.89% and 95.01%, respectively.

CLASSIFICATION OF ASTHMA USING ARTIFICIAL NEURAL NETWORK

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Abstract

This paper presents a system for classification of asthma based on artificial neural network. A total of 1800 Medical Reports were used for neural network training. The system was subsequently tested through the use of 1250 Medical Reports established by physicians from hospital Sarajevo. Out of the aforementioned Medical Reports, 728 were diagnoses of asthma, while 522 were healthy subjects. Out of the 728 asthmatics, 97.11% were correctly classified, and the healthy subjects were classified with an accuracy of 98.85%. Sensitivity and specificity were assessed, as well, which were 97.11% and 98.85%, respectively. Our system for classification of asthma is based on a combination of spirometry (SPIR) and Impulse Oscillometry System (IOS) test results, whose measurement results were inputs to artificial neural network. Artificial neural network is implemented to obtain both static and dynamic assessment of the patient's respiratory system.

POLYMORPHISMS OF 1691G> A AND 4070A> G FV IN BOSNIAN WOMEN WITH PREGNANCY LOSS

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Abstract

BACKGROUND:

The 1691G>A FV polymorphism is considered to be one of the leading genetic risk factors of pregnancy loss (PL). Recently, also other heritable factors of thrombophilia that may predispose to microthrombosis mainly in trophoblast or placenta leading to obstetrical complications attract an attention. In recent studies it was found that 1691G>A and 4070 A>G FV polymorphisms may increase risk of pregnancy loss, and double heterozygosity for 1691G>A and 4070A>G FV conferred a 3- to 4-fold

increase in the relative risk of venous thromboembolism compared with 1691G>A FV alone. Data on prevalence of genetic risk factors of thrombophilia in Bosnia and Herzegovina are rare.

AIM:

Therefore, we aimed to determine the prevalence of 1691G>A FV (rs6025) and 4070A>G FV (rs1800595) polymorphisms in women with and without pregnancy loss.

MATERIAL AND METHODS:

We prospectively recruited 308 women in total, particularly 154 women with PL, mean age 33.0 (\pm 5.4) years and 154 controls without PL, at least one liveborn child, mean age 31.4 (\pm 6.7) years. All women were enrolled from Institution of Health Protection of Women and Motherhood (Sarajevo, Bosnia and Herzegovina). Following DNA isolation from buccal swabs, real-time PCR for 1691G>A FV and PCR-RFLP for 4070A>G FV were done.

RESULTS:

In woman with PL we identified: 142 GG homozygotes, 12 GA heterozygotes and none AA homozygotes of 1691G>A FV, and 125 AA homozygotes, 27 AG heterozygotes and 2 GG homozygotes of 4070A>G FV, while in controls 142 GG homozygotes, 12 GA heterozygotes and none AA homozygotes of 1691G>A FV and 123 AA homozygotes, 28 AG heterozygotes and 3 GG homozygotes of 4070A>G FV.

CONCLUSION:

Our results has shown that the prevalence of 1691G>A and 4070A>G FV polymorphisms was similar in women with pregnancy loss and controls. Therefore, it appears that further studies on large-scale population and other genetic variants will be needed to find candidate genes for PL in Bosnian women.

NETWORK ANALYSIS ON Y CHROMOSOME HAPLOGROUPS IN WESTERN BALKAN POPULATIONS

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Abstract

The region of Western Balkans has been inhabited since the Paleolithic era and was the route of farming from the Middle East to Europe during the Neolithic era (7th millennium BC). In the present study, Y-STR data from worldwide populations have been used to construct median-joining networks. The study was performed using Whit Athey's Haplogroup Predictor, Y Utility and Network 4 software packages to construct networks, perform clustering of closely related Y chromosomes and calculate time estimates between individual nodes. The results of the study imply that geographically close populations cluster together on both worldwide and European level. It was observed that an elevated number of study populations and individual haplogroups increases the possibility that individuals of different racial and ethnic background cluster within the same or neighboring clades of network. An example is the case of the Nigerian population clustering closely with the populations from the Western Balkans. Subsequent

time estimates performed based on the mutation frequency between the ancestral node and its descendant nodes revealed that I2a is the oldest haplogroup in the major area of the Balkan Peninsula (estimated separation time from its ancestral state: 4858 years), followed by haplogroups E1b1b (4088 years) and R1a (3910 years). This study is based on data collected from a single database and, therefore, gives approximations of the relative time distance between the nodes. Our results are nonetheless in accordance with previously published papers investigating the frequency of Y haplogroups based on Y-SNP variant frequencies, indicating that Western Balkan countries are mainly represented by I2a subclade (average for six countries 35.93%), followed by the other two haplogroups (average for six countries 23.16% and 10.62% regarding R1a and E1b1b, respectively).

COMPARATIVE MOLECULAR GENETIC ANALYSIS OF THE ISOLATED BOSNIAN-HERZEGOVININA AND SLOVENIAN POPULATIONS

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Abstract

There are local human communities in Selska Valley which are more or less isolated. In this case, isolation have been influenced mostly by geographic and cultural factors. Therefore, the population of Selska Valley is very suitable for molecular- genetics studies of its population structures. Anthropological studies of Selska Valley are performed in 1993 Vidovic (2005) has analyzed a genetic structure of isolated populations which is based on the distribution of the surnames in this area, using Isonomy method as one of the indirect genetic methods. Fifteen autosomal STR loci have been studied in geographically close, but still isolated, populations of villages located in the valley area. The first goal of this study was to identify the possible differences between the populations from two groups of villages: the lowland villages (Bukovica, Sevlje, Dolenja Vas, Selca, Zelezniki and Zali log) and the mountain villages (Podlonk, Prtovc, Spodnje Danje, Zgornja Sorica and Spodnja Sorica). Even though there have been different isolation levels and openness among these villages, in genetic terms they, especially those in the mountain area, may be considered inland islands. The DNA has been obtained from 86 individuals, and the allele frequencies and genetic diversity have been compared among these

two sample groups. In addition, all of the fifteen STR loci have been used in a comparative population analysis between the Selska Valley and the Bosnian mountain area. Although the sample sizes are relatively small, the observed variation within any of these small isolated populations is high and comparable to less isolated groups. Even though the populations are geographically isolated, the STR data are similar among the populations. Selska Valley and its village populations certainly represents a distinct isolate, and therefore studies of this type could significantly contribute to a better understanding of the populations and isolates in general.

ALLELE FREQUENCIES AND GENETIC PARAMETERS FOR 15 STR LOCI IN THE POPULATION OF BOSNIA AND HERZEGOVINA

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Abstract

Allele frequencies of the 15 polymorphic STR loci (D3S1358, TH01, D21S11, D18S51, Penta E, D5S818, D13S317, D7S820, D16S539, CSF1PO, Penta D, vWA, D8S1179, TPOX, FGA) for Bosnian and Herzegovinian population were established and statistical forensic parameters were calculated. In order to expand national population data with allele frequencies and statistical data for fifteen STR loci, 1000 unrelated individuals born in Bosnia and Herzegovina voluntarily participate in the study. Qiagen Daeasy™ Tissue Kit was used for DNA extraction from buccal swabs. Genomic DNA amplification was performed using PowerPlex® 16 System which enables amplification and detection of 15 STR and amelogenin. For PCR amplification GeneAmp PCR System 9700 (Applied Biosystems) was used. The capillary electrophoresis of amplified products was carried in an ABI 310 Genetic Analyzer while numerical allele designations were determined using GeneMapper®ID software v.3.2. Microsoft Excel workbook template—PowerStats was used for calculating allele frequencies, matching probability (MP), power of discrimination (PD), power of exclusion (PE) and typical paternity index (PI). Powermarker v.3.25 was used for calculation of number of alleles (AN), deviation from Hardy–Weinberg equilibrium, observed and expected heterozygosity (H_o and H_e) and polymorphism information content (PIC). Exact test of population differentiation was estimated using Arlequin v.3.5.1.2. After Bonferroni’s correction, statistical significance for deviation from Hardy–Weinberg equilibrium was considered as $P < 0.01$, while for population differentiation test $P < 0.001$. Number of effective alleles (AE) was estimated by $1/\sum p_i^2$,

where p is allele frequency for particular locus. Ratio of effective and detected allele numbers and its statistical significance were also calculated. No statistically significant deviation ($P > 0.05$) from HWE was found for analyzed loci, except for D8S1179 locus, which was not significant after applying the Bonferroni's correction ($P > 0.01$). Heterozygosity excess has been detected for D3S1358, D21S11, D18S51, D16S539, vWA, TPOX loci. Total of 160 alleles were detected, among which 32 are considered as rare alleles (frequency < 0.005). The highest number of alleles was detected for PentaE (18) and the lowest for TH01 (7).

AN INVESTIGATION ON THE PATERNAL LINEAGES OF THE NORTHERN IRAQI TURKMENS

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Abstract

Today, Iraq is home to numerous ethnic groups, each with their distinct lingual and cultural traditions. Among these ethnic groups, the Iraqi Turkmens (Arabic: □□□□□□ □□□□□□, Turkish: Irak Türkmenleri, Irak Türkleri) are a Turkish speaking ethnic group that constitute the second largest minority in Iraq. In this study, the paternal lineages of a Northern Iraqi Turkmen population sample (n=102) were investigated using the LifeTechnologies AmpFISTR® Yfiler® kit. The Northern Iraqi Turkmen Y-STR dataset was found to have 74 unique haplotypes among 102 samples analysed, and the discrimination capacity and haplotype diversity observed were 72.55% and 0.99592, respectively. Next, an allele frequency- based phylogenetic analysis of the Northern Iraqi Turkmen 17-loci Y-STR dataset along with those from neighbouring and distant populations was carried out. As expected, the Northern Iraqi Turkmen population was found to cluster most closely with the Iraqi population within a Middle Eastern cluster, which included other Turkish and Arabic populations at the next level. Once published, results from this study would constitute the first Y-chromosomal dataset on Iraqi Turkmens in the literature. The Northern Iraqi Turkmen Y-STR dataset is expected to have immediate forensic applications, such as missing person’s investigations. Furthermore, the new Y-STR dataset would also contribute to a better understanding of the population genetics of the Near East in general because despite the historical importance of this geography, unfortunately still very little data exists on the populations therein.

Keywords: Northern Iraqi Turkmens, Middle East, Yfiler, Forensic parameters, Phylogenetic analysis

DIVERSITY OF ACE AND ACTN3 POLYMORPHISMS IN BOSNIAN-HERZEGOVINIAN POPULATIONS

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Abstract

Human ACE gene encodes angiotensin I-converting enzyme with a key role in renin-angiotensin (RAS) and kinin-kallikrein (KKS) systems in the regulation of hemodynamics. ACTN3 gene encodes the muscle α -actinin-3 isoform that stabilises the muscle contractile apparatus. ACE I/D and ACTN3 R577X polymorphisms are both extensively studied for possible association with the human physical performance. Aim was to estimate diversity of ACE and ACTN3 polymorphisms in population of Bosnia and Herzegovina and to evaluate possible association of these gene variants, gender and sports activity. Genomic DNA was extracted from blood and buccal epithelial cells using salting-out method. Total of 242 unrelated healthy individuals were tested, with regard to their gender (N=132 women, N=110 men) and sports activity (N=90 active, N=152 non-active). Genotyping was done by PCR with locus-specific primers. Statistical analyses revealed no significant differences in genotype and allele frequencies of both ACE/ACTN3 genes in Bosnian- Herzegovinians, as well as between compared subgroups of men and women, athletes and non- athletes (P=0.05). Allele frequency distribution showed no deviation from Hardy-Weinberg equilibrium. We also compared our data with available data of other populations. Since no extensive research studies of ACE and ACTN3 genes were conducted in Bosnian-Herzegovinian population, except a few clinical studies, this study can provide further information about genetic diversity of human populations in western Balkan region. It can also serve as an incentive for future studies with larger number of variables, larger cohorts, as well as more applicative context in terms of developing more individualized approach in sports training.

Keywords: ACE, ACTN3 gene variants, genetic diversity, Bosnian-Herzegovinians

TEN-YEAR TRENDS IN PREVALENCE OF DOWN SYNDROME IN A DEVELOPING COUNTRY: IMPACT OF THE MATERNAL AGE AND PRENATAL SCREENING

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Abstract

Objective:

This study examines trends in total and live birth prevalence of trisomy 21 (T21) with regard to increasing maternal age and the introduction of prenatal diagnosis in Bosnia and Herzegovina.

Method:

The prenatal detection was introduced in January 2008 in 3 hospitals and assessed until December 31, 2015. In this study, 99 fetuses and 330 babies were diagnosed with T21 in the studied period.

Results:

On average, each year 33 T21 individuals were born and 13 T21 fetuses were diagnosed prenatally. The calculated incidence for the live born T21 individuals in Bosnia is 1:999. The live-birth prevalence of T21 was 9.6 per 10,000 births and the total prevalence of T21 was 19.1. The total T21 prevalence increases exponentially with the advanced maternal age. Prenatal T21 prevalence is 1.29 per 10,000 births for mothers <35, but increases exponentially with increasing age (32 for >40 years). The most common indications for invasive prenatal testing were ultrasound screening combined with biochemical serum analysis followed by the advanced maternal age.

Conclusion:

The prevalence of liveborn Down syndrome children remained constant. Despite the fact that increasing maternal age in the last decade contributed to the rise in the total T21 prevalence, the effect of the introduction of prenatal diagnosis on the live-birth T21 prevalence of T21 was minimal, leading to the conclusion that the prenatal screening has to be improved in developing countries.

THE COMPARISON OF EFFICACY BETWEEN GENERIC AND BRANDED IMATINIB IN ACHIEVEMENT OF OVERALL SURVIVAL AND CYTOGENETIC RESPONSES IN CML PATIENTS IN BOSNIA AND HERZEGOVINA

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Abstract

Introduction

Imatinib mesylate (Glivec, Novartis) is the first tyrosine kinase inhibitor (TKI) targeting the BCR-ABL1 fusion protein responsible for the pathogenesis of chronic myeloid leukemia (CML). Low cost generic alternatives to imatinib are an integral part of cost effective healthcare strategies for developing countries. However, the use of generics has been associated with different clinical outcomes. In this study, we compared outcomes of two groups of patients who received Glivec as first-line therapy (Group 1) to patients who received generic imatinib as first-line therapy (Group 2) in Bosnia and Herzegovina.

Material and methods

This was a multicenter retrospective cohort study of BCR-ABL1 positive CML patients (n = 53) in the Federation of Bosnia and Herzegovina between 1 June 2005 and 31 March 2016. Glivec was used from 01 June 2005 until 30 September 2013, when all patients had to switch to generics, which was mandated

by the Federal Solidarity Fund that allocates targeted cancer therapies. The following generic imatinib was available: Anzovip (Zdravlje, Actavis) from 09/2013 to 09/2014, Meaxin (Krka) from 09/2014 to 12/2015, and Plivatinib (Pliva) from 12/2015. Patient data was collected from the database of the Federal Solidarity Fund, a subsidiary of the Federal Health Insurance Agency. Branded and generic imatinib was administered orally at dosage of 400 mg/day. Patients who were switched to nilotinib received orally 400 mg/day. Patients on Glivec included in this study started therapy from 0-6 months from time of diagnosis, while patients who started with generics did not wait for therapy. Patient variables that were collected included age, gender, town, date of diagnosis, date of start of therapy, monthly TKI dosage, adverse side effects, progression, lethal outcome, prognostic factors and diagnostic parameters, including cytogenetics and molecular testing. In September 2013, Glivec stopped being available in Bosnia and all CML patients were switched to generic therapy Anzovip. Median duration of each therapy is given in Table 1.

Results

We compared patients on Glivec as first-line therapy (Group 1, n=26) to patients on first-line generic imatinib (Group 2, n=27) with the follow-up period of at least three years for each group. When we compare Groups 1 and 2 using intention to treat analysis, Kaplan-Meier estimated rate of overall survival at 24 months of therapy was 88% vs. 68%, respectively ($p=0.14$), while 69% vs. 70% achieved CCyR ($p=0.12$), respectively. In Group 1, 27% (7/26) patients switched to nilotinib (treatment failure in 2 patients and side effects in 5 patients), 54% (14/26) patients switched to generics because Glivec was no longer available, and 19% (5/26) patients stopped therapy (2 patients stopped therapy and 3 patients died). Of the 7 patients who switched to nilotinib, 71% (5/7) achieved CCyR, 29% (2/7) achieved MMR and none died. Of 19 patients who stayed on imatinib, 68% (13/19) achieved CCyR, 63% (12/19) achieved MMR and 3/19 (16%) died. Of the 54% (14/26) patients who were switched from branded imatinib to generic imatinib, one patient (7%) lost complete cytogenetic response.

Regarding Group 2, 52% (14/27) of patients switched to nilotinib due to treatment failure ($n=8$) and side effects ($n=6$), while 48% (13/27) of patients stayed on generics. Of patients who switched to nilotinib, 43% (6/14) achieved CCyR and 15% (2/14) achieved MMR. Of the patients who stayed on generic imatinib, 100% (13/13) achieved CCyR and 85% (11/13) achieved MMR.

Conclusion

Our results suggest that there was no obvious difference in the treatment efficacy between generic and branded imatinib. At 3 years, there was no significant difference in the overall survival and achievement of CCyR between first-line Glivec and first-line generic imatinib ($p=0.14$, and $p=0.12$, respectively).

THE EFFICACY OF GENERIC IMATINIB AS FIRST-AND SECOND-LINE THERAPY: 3-YEAR FOLLOW-UP OF PATIENTS WITH CHRONIC MYELOID LEUKEMIA

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Abstract

Introduction:

Generics of imatinib mesylate, the first tyrosine kinase inhibitor targeting the BCR-ABL1 fusion protein, have recently been approved in many countries as the alternative, low-cost forms for the treatment of patients with chronic myeloid leukemia (CML). The aim of this study was to evaluate the long-term clinical outcomes of patients with CML receiving first-line and second-line generic imatinib in Bosnia and Herzegovina.

Patients and methods:

This was a multicenter retrospective cohort study of patients (n = 41) treated with generic imatinib in Bosnia between September 1, 2013 and August 5, 2016. Patients were categorized into 2 study groups: Group 1 (n = 27) included newly diagnosed patients with CML receiving front-line generic imatinib, and

Group 2 (n = 14) consisted of patients who started with front-line Glivec and were mandated to switch to the second-line generic imatinib.

Results:

The median follow-up for Group 1 (first-line generic imatinib) and Group 2 (second-line generic imatinib) was 16 and 36 months, respectively. At 36 months, the overall survival for patients in Group 1 was 85%, and the achievement of complete cytogenetic response was 81%. At 24 months, the major molecular response rate was 48%. Overall, 52% of patients switched from first-line generic imatinib to nilotinib owing to treatment failure and side-effects. In Group 2, 93% of patients sustained cytogenetic and molecular response at 3 years after the switch from branded to generic imatinib.

Conclusion:

Our results lead us to conclude that generic imatinib as second-line therapy does not have deleterious effects on patient outcomes. However, first-line generic imatinib showed suboptimal efficacy compared with branded imatinib.

A NOVEL CYTOGENETIC AND MOLECULAR CHARACTERIZATION OF RENAL METANEPHRIC ADENOMA: IDENTIFICATION OF PARTNER GENES INVOLVED IN TRANSLOCATION T(9; 15)(P24; Q24)

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Abstract

Renal metanephric adenoma (MA) is a rare benign tumor frequently misclassified when microscopic features alone are applied. The correct classification of a renal tumor is critical for diagnostic, prognostic, and therapeutic purposes. Despite the advancements in cancer genomics, up until recently relatively few genetic alterations critical to MA development have been recognized. Recent data suggest that 90% of MA have BRAFV600E mutations; the genetics of the remaining 10% are unclear. To date, only one case of a chromosomal translocation, t(9;15)(p24;q24) associated with MA has been reported. However, the potential role of the KANK1 gene, which lies near the breakpoint of the short arm of chromosome 9p24, in the etiology of MA was not examined. We identified the same cytogenetic aberration utilizing molecular cytogenetic techniques in a 22-year-old female patient, and further investigated the genes involved in the translocation that might have contributed to tumorigenesis. A series of fluorescence in situ hybridization (FISH) probes identified the rearranged genes to be KANK1 on chromosome 9 (9p24.3) and NTRK3 on chromosome 15 (15q25.3). Mate-Pair genome sequencing validated the balanced translocation between 9p24.3 and 15q25.3, involving genes KANK1 and NTRK3, respectively. BRAFV600E mutational analysis was normal. Our findings indicate that gene fusions may be one mechanism by which functionally relevant genes are altered in the development of MA. Molecular and cytogenetic analyses have elucidated a novel genetic aberration, which helps to provide a better understanding of this genomic change and assist in diagnosis and classification of new subgroups/entities in metanephric adenomas.

Keywords: Chromosomal translocations, Cytogenetics, KANK1-NTRK3, Metanephric adenoma, Renal cell carcinoma

THE THREE YEAR FOLLOW-UP OF CML PATIENTS TREATED WITH FIRST-LINE GENERIC AND FIRST-LINE BRANDED IMATINIB IN BOSNIA AND HERZEGOVINA

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Abstract

Imatinib mesylate, a selective BCR-ABL tyrosine kinase inhibitor, has been well established as the standard of care for chronic myeloid leukaemia patients. In this study, we compared clinical outcomes of patients who received first-line Glivec (Group 1) with patients who received first-line generic imatinib (Group 2) in Bosnia and Herzegovina with three years follow-up of therapy. At 24 months of therapy, the achievement of complete cytogenetic response and major molecular response were comparable between the studied groups (CCyR was 69% vs. 70%, respectively; MMR was 54% vs. 48%, respectively). After comparing the reasons for the switch to nilotinib, we found that treatment failure was higher in patients treated with generic imatinib (30% vs. 8%, respectively) and side effects were similar in both patient groups (22% vs. 19%, respectively). In general, patients on first-line generic imatinib had higher rates of treatment failure compared to patients treated with first-line branded imatinib.

Keywords: Generic imatinib, Glivec, Clinical outcomes, CML

THE ROLE OF GENERAL DENTAL PRACTITIONERS IN THE DETECTION OF EARLY-STAGE ORAL MALIGNANCIES—A REVIEW

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Abstract

Since early diagnosis plays an important role in oral cancer prognosis, a general dental practitioner's ability to recognize the clinical signs and symptoms is crucial. This review describes the role of general dental practitioners in the recognition of the early stage of oral cancer. To create guidelines for general dental practitioners, several aspects were evaluated: risk factors for the most common oral cancers and precancer, their early signs and symptoms, the role of oral screening in oral cancer prevention, and the importance of a biopsy. The authors also included five case reports which serve as examples for the significance of early detection of oral malignancies.

LONG-TERM OUTCOME OF GIST PATIENTS TREATED WITH DELAYED IMATINIB THERAPY

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Abstract

The introduction of imatinib substantially improved the outcome of gastrointestinal stromal tumour (GIST) patients [1–4]. Even though imatinib has improved the treatment of GIST, its availability in underdeveloped and developing countries like Argentina, Brazil or Bosnia has been limited because of financial considerations and lack of insurance coverage [5,6]. Due to the limited number of available

imatinib therapies, many GIST patients did not receive the drug. Over the years, the number of imatinib therapies gradually increased, but never so that all GIST patients were treated with TKIs.

Keywords: *Gastrointestinal stromal tumour (GIST), Targeted therapy, Outcome, Developing country, Imatinib*

LACK OF ACCESS TO TARGETED CANCER TREATMENT MODALITIES IN THE DEVELOPING WORLD IN THE ERA OF PRECISION MEDICINE: REAL-LIFE LESSONS FROM BOSNIA

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Abstract

Patients with cancer in developing and low-income countries have limited access to targeted cancer therapies. The transitional nature of these economies has influenced health care funding, which has resulted in the unavailability of targeted cancer treatments.^{1,2} Besides the three studies that will be described here, to our knowledge, no literature exists on the clinical outcome of patients treated with delayed targeted cancer therapy. To raise awareness on the importance of timely targeted cancer treatment, we will discuss three key issues: (1) the low number of targeted cancer therapies for different cancers, (2) the delay in cancer treatment, and (3) the unavailability of cancer diagnostics.

THE FREQUENCY OF A NOVEL KANK1 AND NTRK3 TRANSLOCATION AND BRAFV600E MUTATION IN PATIENTS DIAGNOSED WITH METANEPHRIC ADENOMA UTILIZING MOLECULAR MECHANISMS

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Abstract

Background:

Renal metanephric adenoma (MA) is a very rare benign renal tumor, which is frequently misclassified when microscopic features alone are applied. Despite the classification of adenoma as a benign tumor, it is difficult to differentiate from other renal carcinomas such as malignant papillary renal cell carcinomas and in children it can be mistaken with Wilms tumor. The correct classification of a renal tumor is critical for diagnostic, prognostic, and therapeutic purposes. Despite the advancements in cancer genomics, there is limited data available regarding the genetic alterations critical to the metanephric adenoma development. Recent data suggest that 90% of MA have BRAFV600E mutations; the genetics of the remaining 10 % are unclear.

Methods:

This study was conducted on 13 FFPE specimens from patients who were diagnosed with renal metanephric adenoma. H&E stained slides from all cases were reviewed by study pathologist, and representative tissue blocks were further selected for BRAFV600E sequencing and fluorescent in situ

hybridization was adapted to detect chromosomal rearrangement between KANK1 on chromosome 9 (9p24.3) and NTRK3 on chromosome 15 (15q25.3). Results: In this study, we identified a novel chromosomal translocation t(9;15)(p24;q24) between KANK1 and NTRK3, and provided new insights into molecular mechanisms which might identify a subset of metanephric adenomas. Such findings imply that recurrent cytogenetic aberrations may be of prognostic significance as well. Interestingly, our data suggested mutual exclusivity of BRAFV600E and t(9;15) aberrations.

Conclusions:

Molecular and cytogenetic analyses have allowed us to elucidate a genetic aberration, which may be specific to metanephric adenoma. Aberrant expression of the KANK1-NTRK3 gene fusion may be one mechanism by which functionally relevant genes are altered in the development of metanephric adenoma, and thus mark a subgroup of metanephric adenomas with particular clinicopathological features. Also, our study adds KANK1 and NTRK3 to the list of candidate genes that may play a role in the 10% of renal metanephric adenomas that lack a BRAFV600E mutation.

LONG TERM EFFICACY OF NILOTINIB AS FRONT-AND SECOND-LINE THERAPY IN BOSNIA AND HERZEGOVINA: REAL LIFE EXPERIENCE

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Abstract

Background:

In this study we examined the long-term real life clinical outcomes of patients receiving front- line nilotinib and patients who switched from branded or generic imatinib to nilotinib (second-line therapy) in Bosnia and Herzegovina.

Methods:

Patients in CML-CP (n = 70) who started their TKI treatment in period from June 2005 to August 2016 were included in this multicentre retrospective cohort study. Patients were categorized as: Group 1 (n = 31) contained patients receiving front-line nilotinib (300 mg twice daily) and Group 2 (n = 39) consisted of patients who started with front-line imatinib (Glivec or generic imatinib) and then were switched to nilotinib (400 mg or 600 mg twice daily). Nilotinib became available as front or second-line therapy in March 2011. Standard patients' variables were collected and disease progression was established as loss of CCyR and MMR. Survival probabilities were estimated with the Kaplan-Meier method and compared using the log-rank test.

Results:

Seventy patients (median age was 54.5 years; 61% was males) were enrolled in this study. The median follow-up was 39 months (range 3-51 months). Median wait period for therapy was 12 months (range 1-62) from diagnosis. In both studied groups, overall survival was 87% at 39 months. According to ITT principle, achievement of CCyR and MMR at 24 months on nilotinib therapy was higher in Group 1 compared to Group 2 (81% vs 67% and 74% vs 49%, respectively). Rate of death was similar in both studied groups (4/31 vs 5/39). In Group 2, five patients who had suboptimal response on front-line imatinib discontinued therapy (median period of 19.5 months) were switched when nilotinib became available. Interestingly, none of these patients died.

Conclusions:

Our results suggest that at 3 years, there was no difference in the overall survival between studied groups. However, achievement of CCyR and MMR at 24 months was higher in patients on front-line nilotinib therapy. Patients who waited for therapy had optimal response regardless the wait period on nilotinib therapy.

FRONT-LINE NILOTINIB IS A BETTER CHOICE THAN FRONT-LINE IMATINIB FOR CML PATIENTS WITH DELAYED TREATMENT: 11 YEAR FOLLOW-UP

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Abstract

Background

CML patients in developing world had to wait for the start of TKI treatment, from several months to years. The significant delay in proper treatment with imatinib has had drastic consequences on patient outcomes including survival, CCyR and MMR. Nilotinib was introduced in 2011 as front- and second-line therapy for newly diagnosed as well as patients who waited for TKI treatment for a long time.

Aims

In this study we compared the long-term real life clinical outcomes (OS, CCyR and MMR) of patients receiving front- line imatinib and front-line nilotinib therapy in Bosnia and Herzegovina in the period from 08/2005 to 08/2016, categorized based on delayed start of therapy.

Methods

All newly diagnosed CML patients in CML-CP (n=149) who started their TKI treatment in period from August 2005 to August 2016 were included in this multicentre retrospective cohort study. Patients were categorized as: Group 1 (n=118) consisted of patients who started with front-line imatinib (300 mg, 400 mg or 600 mg twice daily; Glivec or generic imatinib therapy) and Group 2 (n=31) contained patients receiving front-line nilotinib (300 mg twice daily). Patients on imatinib were further categorized by the duration of treatment delay into three subgroups (<5 months, 6-13 months and >13 months) and patients on nilotinib therapy were divided into two subgroups (patients who waited less and more than 6 months on the start of therapy). Nilotinib became available as front or second-line therapy in March 2011. Standard patients' variables were collected and disease progression was established as loss of

CCyR and MMR. Survival probabilities were estimated with the Kaplan-Meier method and compared using the log-rank test.

Results

We analyzed 149 patients (median age was 54.5 years; 57% was males) in chronic phase of CML. The median follow-up from time of diagnosis and start of therapy was 45 months and 39 months, respectively (range 3-145 months). Median wait period for therapy in patients who waited less and more than 6 months was 0 months (range 0-6) vs 15 months in the waiting group (range 9-63). At 11 years, overall survival for patients on front-line imatinib (Group 1) and front-line nilotinib (Group 2) was 83% and 87%, respectively. According to ITT principle, achievement of CCyR and MMR at 24 months was higher in Group 2 compared to Group 1 (81% vs 66% and 74% vs 37%, respectively). Rate of death was similar in both studied groups (20/118 vs 4/31). When we analysed delayed treatment at 24 months, CCyR for patients who received therapy immediately, who waited 6-13 months and more than 13 months, was 74% vs 64% vs 40%, respectively. Regarding nilotinib treatment at 24 months, patients on 1st line immediate nilotinib vs 1st line delayed nilotinib achieved 83% vs 77% for CCyR and 78% vs 69% for MMR, respectively.

Conclusion

Our results after 11 years of follow up suggest that nilotinib demonstrated improved efficacy over imatinib therapy. Achievement of CCyR and MMR at 24 months was higher in patients on front-line nilotinib therapy. Patients who waited for therapy had optimal response regardless the wait period on nilotinib therapy.

Keywords: *Tyrosine kinase inhibitor, Molecular response, Cytogenetics, Chronic myeloid leukemia*

SILICON NANOWIRES SUBSTRATES FABRICATION FOR ULTRA-SENSITIVE SURFACE ENHANCED RAMAN SPECTROSCOPY SENSORS

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Abstract

The silicon based substrates for surface enhanced Raman spectroscopy (SERS) have been synthesized and tested. The silver-assisted electroless wet chemical etching method has been utilized for silicon nanowires production which has been proved as the promising SERS substrate. The morphology of the silicon nanowires coated with silver nanoparticles has been examined by scanning electron microscopy. The SERS measurements tested on rhodamine 6G molecules indicated the optimal silicon nanowire substrate production obtained for 5 M hydrofluoric acid and 30 mM silver nitrate etching solution. The results show SERS detection limit of 10^{-8} M rhodamine in aqueous solution.

Keywords: *Electroless chemical etching, Surface enhanced Raman spectroscopy, Silicon nanowires, Rhodamine*

DEVELOPMENT OF NEW CHEMILUMINESCENCE BIOSENSORS FOR DETERMINATION OF BIOGENIC AMINES IN MEAT

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Abstract

Development of chemiluminescence one-shot biosensors for determination of biogenic amines is described and compared with high-performance liquid chromatography (HPLC) method coupled with pre-column derivatisation. The biosensors are based on enzymatic oxidation to 4-aminobutyraldehyde with putrescine oxidase or diamine oxidase as catalysts. The lowest measured concentration for the biosensor with putrescine oxidase was 1 mg/L. The detection limit, calculated as 3σ value, was 0.8 mg/L. The biosensor with diamine oxidase had the lowest measured concentration of 1 mg/L of putrescine. Detection limit, calculated as 3σ value, was 1.3 mg/L. Biosensors were tested on five different meat samples, and the results were compared with HPLC coupled with pre-column derivatization. Results showed that new biosensors could be used in determination of putrescine concentration in meat samples but improvements, such as sample pretreatment before determination or design of interference free biosensor, are required.

Keywords: Biogenic amine, Determination, Chemiluminescence, Biosensor, Putrescine, Meat freshness

OVERVIEW OF NEXT-GENERATION SEQUENCING PLATFORMS USED IN PUBLISHED DRAFT PLANT GENOMES IN LIGHT OF GENOTYPIZATION OF IMMORTELLE PLANT (HELICHRYSIUM ARENARIUM)

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Abstract

INTRODUCTION:

Major advancements in DNA sequencing methods introduced in the first decade of the new millennium initiated a rapid expansion of sequencing studies, which yielded a tremendous amount of DNA sequence data, including whole sequenced genomes of various species, including plants. A set of novel sequencing platforms, often collectively named as "next-generation sequencing" (NGS) completely transformed the life sciences, by allowing extensive throughput, while greatly reducing the necessary time, labor and cost of any sequencing endeavor.

PURPOSE:

of this paper is to present an overview NGS platforms used to produce the current compendium of published draft genomes of various plants, namely the Roche/454, ABI/SOLiD, and Solexa/Illumina, and to determine the most frequently used platform for the whole genome sequencing of plants in light of genotypization of immortelle plant.

MATERIALS AND METHODS:

45 papers were selected (with 47 presented plant genome draft sequences), and utilized sequencing techniques and NGS platforms (Roche/454, ABI/SOLiD and Illumina/Solexa) in selected papers were determined. Subsequently, frequency of usage of each platform or combination of platforms was calculated.

RESULTS:

Illumina/Solexa platforms are by used either as sole sequencing tool in 40.42% of published genomes, or in combination with other platforms - additional 48.94% of published genomes, followed by Roche/454 platforms, used in combination with traditional Sanger sequencing method (10.64%), and never as a sole tool. ABI/SOLiD was only used in combination with Illumina/Solexa and Roche/454 in 4.25% of publications.

CONCLUSIONS:

*Illumina/Solexa platforms are by far most preferred by researchers, most probably due to most affordable sequencing costs. Taking into consideration the current economic situation in the Balkans region, Illumina Solexa is the best (if not the only) platform choice if the sequencing of immortal plant (*Helichrysum arenarium*) is to be performed by the researchers in this region.*

Keywords: *Base Sequence; High-Throughput Nucleotide Sequencing; Plant Genome*

NANOMATERIALS IN MODERN TECHNOLOGY WITH EMPHASIS ON APPLICATION IN MODERN MEDICINE

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Abstract

Nanotechnology, as the most advanced technology today, enables the creation of two types of nanotech tools - nanomaterials (revolutionary new materials) and nanodevices, which are ubiquitous in many areas of engineering, information technology, telecommunications, agro-industry, ecology, military and cosmic industry, etc. The most important application and achievement of nanotechnology are in the field medicine. This led to the development of the specialized branch of medicine that connects nanotechnology and medicine and it is known as nanomedicine. Nanomedicine deals with the diagnosis, treatment, monitoring and control of biological systems with the help of nanotechnology. Increased applications of nanomaterials are followed with increased concern about potential risks of their application. The importance, advantages and disadvantages of nanomaterials and their applications are presented in this paper with focus on nanomedicine.

APPLICATION OF BIOLOGICAL SURFACE ADSORPTION INDEX APPROACH (BSAI) IN CHARACTERIZATION OF INTERACTIONS BETWEEN GOLD NANOPARTICLES AND BIOMOLECULES

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Abstract

The biological surface adsorption index approach (BSAI) presents a novel approach for characterization of nanoparticles (NPs) in biological systems. It is used for identification and quantitation of intermolecular forces that govern the adsorption properties of biomolecules on NPs surface. BSAI presents very important step in characterization of NPs-biomolecules interactions. Knowledge about the mechanism of interactions could help in prediction of NPs eventual toxicity in biological systems. Gold NPs are very often used in medicine, cosmetics and pharmacy thus evaluation of potential toxicity of gold NPs is extremely important prior its application. In this paper BSAI approach was applied on gold NPs with three different size (5 nm, 15 nm and 30 nm). The results showed that interactions of gold NPs and biomolecules vary in dependence of the size of NPs. The results contribute in toxicity assessment of gold nanoparticles in combination with other analytical tools for toxicity assessment.

Keywords: Gold nanoparticles, Interactions, Characterization, Adsorption Nanodescriptors

DEVELOPMENT OF THE METHOD FOR QUANTIFICATION OF AMINO ACID ADSORBED ON NANOPARTICLE SURFACE

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Abstract

Bio-functionalization of nanoparticles with amino acids increases their biocompatibility and make them more efficient in delivery systems, especially in drug delivery and gene therapy. This can lead to development of new detection methods, in the field of clinical diagnostics, biosensors and DNA receptors. Alongside, understanding of the mechanism of amino acid adsorption on nanoparticle surface contributes to the evaluation of complex interaction between nanoparticles and proteins. Thus, development of methods for amino acid quantitation and characterization is very important. Still, the number of methods is very limited. We report a strategy for the quantification of cysteine adsorbed on gold, silver and silica nanoparticles by modified ninhydrin method. In order to obtain the most suitable ratio for amino acid adsorption, optimized parameters were: amino acid concentration, ratio of amino

acids to nanoparticles, and nanoparticle concentration. Values of absorbance were measured by UV-Vis spectrophotometry and used for calculating the mass of adsorbed amino acid. The size of nanoparticles lacked an effect on amino acids whereas the ratio of amino acid to nanoparticles was revealed as a critical parameter. The method suggests 9:1 ratio as the most suitable for amino acid-nanoparticle interaction in case of both, gold and silica nanoparticles.

APPLICATION OF ISOTHERMAL TITRATION CALORIMETRY IN EVALUATION OF PROTEIN–NANOPARTICLE INTERACTIONS

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Abstract

Nanoparticles (NPs) offer a number of advantages over small organic molecules for controlling protein behaviors within the cell. Protein binding to the surface of NPs depends on their surface characteristics, composition and method of preparation (Mandal et al., J Hazard Mater 248-249: 238-245, 2013). It is important to understand the binding affinities, stoichiometries and thermodynamic parameters of NP-protein interactions in order to see which interaction will have toxic and dangerous consequences and thus prevent it. On the other side, because proteins are on the brink of stability, they may experience interactions with some types of NPs that are strong enough to cause denaturation or significantly alter their conformations with concomitant loss of their biological function. Structural changes in the protein may cause exposure of new antigenic sites, "cryptic" peptide epitopes, potentially triggering an immune response that can promote autoimmune disease (Treuel et al. In ACS Nano 8 (1): 503-513, 2014). Mechanistic details of protein structural changes at NP surface have still remained elusive. Understanding the formation and persistence of the protein corona is critical; However, there are no many analytical methods that could provide detailed information about the NP-protein interaction characteristics and about protein structural changes caused by interactions with nanoparticles. The article reviews recent studies in the NP-protein interactions research and application of isothermal titration calorimetry (ITC) in this research. The study of protein structural changes upon adsorption on nanoparticle surface and application of ITC in these studies is emphasized. The data illustrates that ITC is a versatile tool for evaluating interactions between NPs and proteins. When coupled with other analytical methods, it is important analytical tool for monitoring conformational changes in proteins.

Keywords: *Isotermic titration calorimetry, Nanoparticles, Proteins, Interactions, Gold nanoparticles, Protein-nanoparticle interaction*

APPLICATION OF NANOTECHNOLOGY IN FOOD PACKAGING

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Abstract

Rapid advancements in nanosciences and nanotechnologies in recent years are offering a variety of benefits to the whole of agro-food production chain. The main focus appears to be on food packaging and health food products. Nano-enhanced packaging has much to offer. Benefits range from stronger and more flexible films, to smart packaging which can vastly simplify stock management and monitor food condition. However, as with many burgeoning areas of nanotechnology, there are some concerns which must be raised. It is not yet completely clear to what extent nanoparticles embedded in packaging films can leach into food products, and what the effects of exposure to various nanomaterials on consumer health might be. Whilst these issues are still being explored, one thing is for sure - the next few years will bring important and fascinating developments in nanotechnology for packaging, which may well act as a model for progress across all commercial applications of nanotechnology.

INSPECTION PROCESS OF MEDICAL DEVICES IN HEALTHCARE INSTITUTIONS: SOFTWARE SOLUTION

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Abstract

With increased sophistication of electrical medical devices and more dynamic working environment conditions, safety and accuracy requirements are becoming more strict. Healthcare institutions are challenged in keeping their electrical medical devices safe to use, accurate and reliable in terms of measuring and monitoring of vital parameters. In healthcare institutions maintaining overall operating functions at the required level of performance can be achieved through periodical safety performance inspections. International guidelines, such as Directives IEC 60601, ISO 62353 and MDD 93/42, define how healthcare institutions should perform these periodical checks. In countries, where those guidelines are not adopted, medical device safety and performance inspections are conducted in accordance to Directives of new approach. This paper presents the software solution for tracking the inspection process of medical devices in public and private healthcare institutions. The software is implemented in Oracle Application Development Framework Technology (ADF) and it is used to facilitate gathering of documents such as Inspection Certificates, Working Orders, Measurement Reports, Calculated Errors, and also to keep track of dates for next inspection. The software can be accessed online via Inspection Laboratory website, and all clients, as well as professional laboratory staff can login using their own username and password which makes all inspection data confidential. The software solution is validated in private and public healthcare institutions in Bosnia and Herzegovina (BH). Out of 331 public and private health care institutions in BH, software solution was validated in 218 institutions and more than 1800 inspection tests reports were imported in software by the date that this paper was written.

Keywords: Safety, Performance, Inspection, Medical devices, Metrology, Software, Healthcare, Information technology

TESTING OF MECHANICAL VENTILATORS AND INFANT INCUBATORS IN HEALTHCARE INSTITUTIONS

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Abstract

The medical device industry has grown rapidly and incessantly over the past century. The sophistication and complexity of the designed instrumentation is nowadays rising and, with it, has also increased the need to develop some better, more effective and efficient maintenance processes, as part of the safety and performance requirements. This paper presents the results of performance tests conducted on 50 mechanical ventilators and 50 infant incubators used in various public healthcare institutions. Testing was conducted in accordance to safety and performance requirements stated in relevant international standards, directives and legal metrology policies. Testing of output parameters for mechanical ventilators was performed in 4 measuring points while testing of output parameters for infant incubators was performed in 7 measuring points for each infant incubator. As performance criteria, relative error of output parameters for mechanical ventilators and absolute error of output parameters for infant incubators was calculated. The ranges of permissible error, for both groups of devices, are regulated by the Rules on Metrological and Technical Requirements published in the Official Gazette of Bosnia and Herzegovina No. 75/14, which are defined based on international recommendations, standards and guidelines. All ventilators and incubators were tested by etalons calibrated in an ISO 17025 accredited laboratory, which provides compliance to international standards for all measured parameters. The results show that 30% of the tested medical devices are not operating properly and should be serviced, recalibrated and/or removed from daily application.

Keywords: Health technology management, Clinical engineering, Healthcare, Infant incubators, Mechanical ventilators, Output parameters, Safety, Standards, Testing

APPLICATIONS OF QSAR STUDY IN DRUG DESIGN

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Abstract

Quantitative structure-activity relationship (QSAR) and quantitative structure-property relationship (QSPR) studies are important in silico methods in rational drug design. The aim of this methods are to optimize the existing leads in order to improve their biological activities and physico-chemical properties. Also, to predict the biological activities of untested and sometimes yet unavailable compounds. This article is a general review of different QSAR/QSPR studies in different previous researches. R2 and Q2 parameters are used in some studies to predict the predictability and robustness of the constructed models. In all mentioned articles QSAR study were good prediction tool for investigation drug activity or binding mode on specific receptors.

Keywords: Drug design, QSAR, QSPR, Molecular Descriptor, Coefficient of Determination R2, Squared Correlation Coefficient Q2.

TELEMETRY SYSTEM FOR DIAGNOSIS OF ASTHMA AND CHRONICAL OBSTRUCTIVE PULMONARY DISEASE (COPD)

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Abstract

For people who live in rural or remote areas, or have a limited possibility of movement, disease is diagnosed late in the course, which unfortunately often results in death. In order to increase awareness among people and to reduce mortality rates, telemetry systems play a very important role. This paper presents the telemetry system for diagnosis of Asthma and COPD 1. Developed telemetry system is implemented using Android, Java, MATLAB and PHP technologies. Classification of respiratory diseases is implemented in our previous papers. During the six months' period telemetry system was tested on 541 subjects, where 324 were classified as asthmatics or COPD while 217 were classified as healthy subjects. Implemented system uses a spirometer connected via Bluetooth with a mobile phone application for sending data to the server where is installed Expert System for classification of Asthma and COPD. After the classification process Expert System is sending a diagnosis to the patient via e-mail.

Keywords: Telemetry, Expert System, Disease, Classification, Asthma, COPD

TESTING OF THERAPEUTIC ULTRASOUND IN HEALTHCARE INSTITUTIONS IN BOSNIA AND HERZEGOVINA

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Abstract

Electrical medical equipment are complex and sophisticated and are expected to operate under strict requirements and over longer time period. Healthcare institutions are facing challenge in keeping electrical medical equipment safe, accurate, reliable with operating performance at the acceptable level. Periodical performance inspections are therefore of great importance. The performance of therapeutical ultrasounds in healthcare institutions in Bosnia and Herzegovina is periodically inspected in accordance to national rules (Official Gazette of Bosnia and Herzegovina No. 75/14) and international recommendations (IEC 60601). This paper presents the results of performance inspection of 117 therapeutical ultrasounds measured by independent laboratory for inspection of medical devices appointed by Institute of Metrology of Bosnia and Herzegovina. The results show that nearly 30% of inspected devices do not operate properly. Out of nearly 30% of faulty device, in approximately 41% cases transducer heads are not operating properly. Through this paper, the importance of periodical inspection of performance of therapeutical ultrasounds by professional engineering staff is pointed out. Inspection of performance is irreplaceable step in increasing quality of healthcare.

A DISSIMILAR APPROACH TO ASSOCIATING ANGIOTENSIN CONVERTING ENZYME POLYMORPHISMS CHANGES IN BLOOD PRESSURE AND HEART RATE MEASUREMENT UNDERGRADUATE STUDENTS DURING EXAM PERIOD

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Abstract

Angiotensin I converting enzyme (ACE) gene, as a component of Renin-Angiotensin System (RAS), regulates blood pressure as it converts somatic isozyme Angiotensin I into physiologically active peptide Angiotensin II and simultaneously brakes down bradykinins. Over 100 polymorphisms are reported for ACE gene. Most of these polymorphisms having no phenotypic effect relay the attention towards polymorphisms based on insertions (I) or deletions (D) of a 287 bp Alu repeat sequence in 16th intron. There are three possible genotypes for the stated polymorphism: DD, DI or II. There have been a lot of studies searching for direct associations between ACE polymorphisms and performance phenotypes along different sports requiring power or endurance. The previous experiments are based on the performance criteria but direct associations of ACE polymorphisms are not fully understood until today. We believe different approaches may aid scientist to plot the big picture. A sample population of 101 individuals from Bosnia and Herzegovina contributed to sample pool of the initial project. Buccal swabs from 101 samples were collected along with a phenotypic structure and environmental characteristic survey which was filled by each individual himself/herself. Genotypes of the individuals were obtained

after isolation, amplification and gel electrophoresis of biological samples collected as buccal swabs. A total of 165 artificial neural network (ANN) models were developed considering the input parameters, possible genotype outputs, applied algorithm and sample size. The aim of developing various ANNs was to validate a possible ACE polymorphism genotype prediction algorithm based on phenotypic and environmental characteristics of individuals, in other words, without any biological testing. A two-layered feed-forward network, with sigmoid hidden neurons was designed to perform the classification of input data. Trainscg (Scaled Conjugate Gradient) activation function was used in hidden layer since classification of data was non-linear. All ANN models were trained with scaled conjugate gradient backpropagation. ANN models differing in the parameters has shown different accuracy in the results. Most outstanding result was observed in the ANN build composed of 2 distinctive layers with 500 neurons in the first and 3 neurons in the second layer. Trained with 70% of samples and verified with 15% of samples and validated with an additional 50 samples. Training set was composed of the following subject parameters; gender, eye color, hair color, height, weight, presence of hypertension in family and presence of cardiovascular diseases in family. The highest prediction accuracy was obtained as 86,6 % training score, 78,6 % testing score and 80,2 % overall score in genotype prediction for ACE polymorphisms. With further development of data collection and high resolution analysis, overall score could be boosted. Also, phenotypical data can be applied as markers of genotypes in ACE polymorphisms.

Keywords: ACE Gene, Polymorphisms, Artificial Neural Networks, Genotype Prediction

NEW POSSIBLE TARGETABLE GENES FOR FUTURE TREATMENT OF MIXED LINEAGE LEUKEMIA

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Abstract

Aim of study:

Leukemia has different subtypes, which present unique clinical and molecular characteristics. MLL (Mixed Lineage Leukemia) is one of the new different subtypes than AML and ALL.

Materials and Methods:

Genomic characterization is the main key understanding the differences of MLL by analysis of differential gene expression, methylation patterns and mutational spectra that were compared and analyzed between MLL and AML types (n=197).

Results:

According to the genomic characterization of MLL, differentially expressed 114 genes were selected and 37 of them targeted genes having more than 2 fold expression change, including HOXA9, CFH, DDX4, MSH4, MSMB, TWIST1, ZSWIM2, POU6F2. To measure the aberrant methylation is the second genomic characterization of this research because the rearrangements of MLL gene leading to aberrant methylation. The methylation data were compared between cancer and control, so high methylated genes have been detected between MLL and AML types. The methylation loci were categorized into two groups: ≥ 10 fold difference and ≥ 5 and ≤ 10 fold difference. Some of the genes high methylated more than one location such as; RAET1E, HSD17B2, RNASE11, DGK1, POU6F2, NAGS, PIK3C2G, GADL1, and KRT13. In addition to that, analysis of somatic mutation gives us that CFH has the highest point mutation 9,92%.

Conclusion:

Overall, the MLL genomic characterization shows that it is different than AML and exhibits a unique molecular and biological phenotype and point to new possible targetable genes for future treatment of MLL leukemia are two important values.

Keywords: MLL type leukemia, Genomic analyzes, Gene expression, Methylation, Mutation

III PART: Faculty of Education

THE RELATIONSHIP BETWEEN GENDER, MOTIVATION AND ACHIEVEMENT IN LEARNING ENGLISH AS A FOREIGN LANGUAGE

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Abstract

This study deals with the research into the relationship between gender, motivation and achievement in learning English as a foreign language. A good command of English is of paramount importance for an individual to be successful in numerous aspects of life such as professional, personal and educational. The aim of this research was to determine how gender influences motivation and achievement in learning English as a foreign language. The research sample consists of 185 students aged ten (fifth grade), fourteen (ninth grade) and eighteen (twelfth grade). The results demonstrate a statistically significant relationship between gender and motivation. Ten-year-old students exhibit the highest motivation for learning English as a foreign language, while the eighteen-year-olds exhibit the lowest motivation. In addition, female students are more successful at learning English as a foreign language than male students at each group/grade level. Moreover, the findings also reveal statistically significant results in measuring the correlation between achievement and motivation and can be highly beneficial for teachers, parents and students in adopting the most effective approach to learning and teaching English as a foreign language.

Keywords: Motivation, Gender, Foreign Language, Grade Level, Achievement, Correlation

WILLINGNESS TO COMMUNICATE IN ENGLISH AS A FOREIGN LANGUAGE IN BOSNIAN-HERZEGOVINIAN EFL CONTEXT

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Abstract

Willingness to communicate (WTC) has recently been extensively investigated in the field of language study, especially in second language acquisition studies and communication studies. Studies suggest that WTC is an important tool that can facilitate language learning. Hence, the aim of instructors when teaching a language should be to increase the students' WTC. The aim of this study is to explore the Bosnian-Herzegovinian university students' willingness to communicate in English as a foreign language in different situational and interpersonal contexts. For that purpose, the Willingness to Communicate Questionnaire (McCroskey, Richmond, 2013) was utilized. The instrument consists of seven sub-scales: group discussion, meetings, interpersonal, public speaking, friend, acquaintance, stranger and it consists of 20 items. The research sample consists of 193 students from three universities in Bosnia and Herzegovina, two public universities and one private university. The results show that students' grade level, type of university and GPA significantly affect their willingness to communicate, while gender, nationality, or the number of foreign languages that students speak do not affect their WTC. Since this concept has not been studied broadly in the Bosnian-Herzegovinian EFL context, findings of this quantitative study might facilitate the process of setting pedagogical aims in English language instruction in Bosnia and Herzegovina, with special emphasis on WTC.

Keywords: *WTC, Communication, Foreign Language, Achievement*

SOCRATIC METHOD AS AN APPROACH TO TEACHING

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Abstract

The theoretical view of Socrates' life and his method in teaching. After the biographical facts of Socrates and his life, we explained the method he used in teaching and the two main types of his method, Classic and Modern Socratic Method. Since the core of Socrates' approach is the dialogue as a form of teaching we explained how exactly the Socratic dialogue goes. Besides that, we presented two examples of dialogues that Socrates led, Meno and Gorgias. Socratic circle is also one of the aspects that we presented in this paper. It is the form of seminars that is crucial for group discussions of a given theme. At the end, some disadvantages of the Method are explained. With this paper, the reader can get the conception of this approach of teaching and can use Socrates as an example of how successful teacher leads his students towards the goal.

Keywords: Socratic Method, Dialogue, Seminar, Teaching, Life-Long Learning

THE IMPORTANCE OF LEARNING STYLES IN THE EFL CLASSROOM

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Abstract

This paper deals with teaching management of different learning styles students use in the EFL classroom. It explores various types of learning styles and it provides directions that can help EFL teachers in better understanding of various learning preferences and in responding to different types of learners. Different types of learners are also treated in this paper. In addition to theoretical explanations for every type of learner mentioned, different methods and approaches are incorporated, together with suggestions for activities suitable for particular learners. The last part of the paper is a study of Bosnian teenagers' learning styles and their implication in teaching. The aim of the study was to investigate major learning styles of Sarajevo teenagers and how they affect their learning. The results and analysis of the study are presented at the end of this paper.

USE OF AUTHENTIC MATERIALS AND L1 IN ENGLISH LANGUAGE LEARNING CLASSROOMS IN B&H

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Abstract

In the modern society people are exposed to English almost all the time and everywhere. English is heard on TV, read in books, people from different countries communicate with each other in this language. Therefore, it is not surprising that the need for studying the effects of the exposure to English on the developing of English language proficiency has arisen. This paper examines the exposure of Bosnian students to the English language outside of the classroom and provides a comparison between private and public schools, as well as between elementary and high schools. Another aspect of investigation are the perceptions of Bosnian teachers and students regarding the use of the mother tongue (L1) in EFL classrooms. With the switch from grammar-translation method to communicative approaches, the role of L1 in English language learning classrooms has become highly disputed, and the current paper attempts to shed light on this issue.

STUDENTS' AND TEACHERS' PERCEPTIONS ON SKILLS ACQUISITION AND ERROR CORRECTION TREATMENT IN BOSNIAN EFL CONTEXT

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Abstract

The presence of the English language in various domains of everyday life cannot be neglected, since it is easily encountered in politics, social networks, media and newspapers worldwide, including Bosnia and Herzegovina, where especially the conditions of the post-war period contributed to the need of learning it. Even though English is widely present as a foreign language in elementary and high schools in Bosnia and Herzegovina, its acquisition has not been largely investigated. The current paper aims at exploring students' and teachers' perceptions regarding the development of language skills in English, as an important aspect of acquiring a language and one of the key prerequisites for its successful use.

THE ASSESSMENT OF BOSNIAN EFL LEARNERS' KNOWLEDGE BY TWO DIFFERENT MEASURES: TEST AND WRITING ASSIGNMEN

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Abstract

English is taught as a foreign language in elementary and high schools in Bosnia and Herzegovina (BIH). However, since the number of English classes per week is very limited they should be utilized in the best possible way to produce proficient users of English. Nowadays, when language proficiency is viewed as one's ability to speak and write in the target language and not about it, the need for the proficiency evaluation in schools arises. The present study attempts to shed a spot of light on this issue, investigating two very common ways of assessing students' knowledge in schools, namely tests and writing assignments. Hence, through the interviews with English teachers and the analysis of students' tests and writing assignments, the current paper explores the ways in which these two measures are realized, the tasks they consist of, the type of linguistic knowledge they are used to evaluate, their levels of difficulty, and the type of corrective feedback teachers provide on both of them. The results suggest that teachers on both measure rather students' explicit than their implicit knowledge, focusing much more on accuracy than fluency development.

Keywords: Assessment, Test, Writing Assignment, Corrective Feedback, EFL

CARYL PHILLIPS AND THE RHIZOMORPHOUS GAZE: A GEOPHILOSOPHICAL READING OF CROSSING THE RIVER

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Abstract

Caryl Phillips's narratives are generally known for their fragmentation, ambiguity, displaced characters, mindboggling geographical and social passages, and intertextual allusions. Crossing the River similarly embodies fragmentation in its substance and narrative form(s), and it also features transgressors and travelers who geographically and socially cross borders and undergo deep transformations. Therefore, one's initial experience of reading Phillips's labyrinthine writing – such as Crossing the River – is that of utter confusion. In the academia, earlier studies have properly addressed the issues of Phillips's agenda: memory of oppression and displacement, history of dislocation and exile, and ultimate diasporic experience. This paper, however, proposes an alternative perspective for Caryl Phillips's readers: a geophilosophical analysis. This paper suggests that Phillips's sophistication arises not only from his writing agenda but also from his aesthetic concerns in handling historical nonequilibrium. Bertrand Westphal states: "Nonequilibrium is coherent and, ultimately, more interesting than equilibrium, since the latter is deprived of history." Westphal also compares "equilibrium" with "a nonstory" and "nonequilibrium" with "a complex story" (19). As this paper suggests, geophilosophical reading makes more sense of Phillipsian dense modus operandi and artistic intents. This model also juxtaposes Crossing the River and Phillips's other narratives. Under such a scrutiny, Phillipsian fragmentation presents a "patchwork" of his "rhizomorphous" gaze at the nonequilibrium, and geographical and social passages are merely "smoothing" movements from "striations" of "the state apparatus," and displaced characters turn into border-crossing "nomads" for whom displacement is an "intermezzo."

BÂKÎ'NİN “CÂNÂ” REDİFLİ GAZELİNİN ŞERHİ VE YAPISALCIK AÇISINDAN İNCELENMESİ

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Abstract

Bu çalışmanın amacını, Kanuni devrinde dönemin en büyük şairi sayılarak kendi sine “Sultânü’ş-şuarâ” unvanı verilmiş, namı ve eserleri Anadolu ve Rumeli’nin dört bir yanına yayılmış, Hindistan’a kadar adını duyurmuş olan Bâkî’nin “Cânâ” redifli gazelinin şerhi ve ardından yapısalcılık bakımından incelenmesi oluşturmuştur. Yirminci yüzyıl ile birlikte dil ve edebiyat dünyamıza giren yapısalcılık, modern tarzda metin inceleme yöntemidir. Klasik Türk edebiyatı metinleri geleneksel şerh yöntemlerinin dışında yapısal olarak incelendiğinde şekil, içerik, anlam ve sanatsal değer bakımından daha açıklayıcı ve anlaşılır olacaktır. Bu açıdan çalışmada, Bâkî’nin “Cânâ” redifli gazeli bu hedef doğrultusunda incelenmiş, sanat ve estetik değeri saptanmıştır.

Keywords: Bâkî, Yapısalcılık, Klasik Şerh, Gazel, Klasik Türk Edebiyatı, Cânâ

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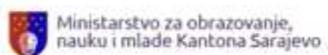
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