

«OPTIMIZING THE PERFORMANCE OF ONTOLOGICAL KNOWLEDGE BASES BUILT ON THE BASIS OF «VIRTUOSO» (p. 4-8)

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This work contains a research of available methods on query optimization of OWL knowledge bases that are built using the SPARQL language, and also by using the available frameworks (e.g. Apache Jena Framework).

Currently, there is a special need to improve the performance of existing tools to work with knowledge bases. This need is caused by a lack of the speed, and sometimes, by a very low performance of systems that uses a knowledge bases as a data storage.

As a result of the research it was found an opportunity of significant performance optimization of interactions with knowledge bases, based on Virtuoso server, by applying the described optimization techniques that resulted in an increase in execution speed, in average from 25 % to 35 %, with a relatively small number of triplets.

This information will help developers to reduce the time of interaction with knowledge base server that will significantly speed up the performance of applications that use similar data storage.

Keywords: query, optimization, triplet, SPARQL, Jena Framework, Caching, Virtuoso, OWL, RDF, BGP, SPARUL, Pattern.

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APPLICATION OF LARGE-SCALE LINGUISTIC RESOURCES FOR THE DOMAIN ONTOLOGY EXTENSION (FOR THE DOMAIN OF «RADIATION SAFETY») (p. 9-14)

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The paper proposes a new semi-automatic method, based on the NLP (natural language processing) principles for extension of the basic ontology (BO) for the domain of “Radiation Safety”.

Using this method, existing BO was extended with new examples, found in the corpus and related to basic concepts by the relation of synonymy. Thus, the possibility and effectiveness of external linguistic resource for finding synonyms of the concepts of basic domain ontology in the text corpus was proved. The results have shown a high level of relevance.

It was found in the experiment that pre-linguistic modeling and completeness of lexical resource play an important role for obtaining good results in the automatic extension of BO. This method can be considered as an important chain, still largely missing, necessary to raise the automatic ontology construction to a new level.

Keywords: information extraction, relation recognition rules, example recognition rules, ontology extension, semantic analysis, radiation safety.

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MODEL OF COMPETITIVE MINI-HOTEL PROJECT LIFE CYCLE (p. 15-19)

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Having examined the situation in the hotel market of the city of Kharkov (Ukraine), it was found that one of the major shortcomings in the activities of mini-hotels is mediocre attitude towards customers, lack of proper attention and poor services. In this regard, there is the need to create a mini-hotel, the most important mission of which would be a genuine concern for guests and their comfort, as well as providing unique services of the highest class.

For the success of this mission, it is necessary to use modern IT-technologies and information systems that support the competitive mini-hotel project life cycle. It must be kept in mind that project implementation depends on many factors, affecting the life cycle phases, with limitations, primarily on cost, time and emerging risks. Without a formalized description of the interrelationship among existing project phases, it is difficult for the customer and the developer of the project to take into account many informal factors.

Therefore, the need to improve the competitiveness of mini-hotel was considered, and a mathematical model of the mini-hotel project life cycle, which has a key role in its implementation was developed. The investigation of hotel services in order to develop measures on improving the competitiveness of hotel services was performed.

Solving these tasks will ensure the development of advanced forms and methods of effective management of hotel industry enterprises in Kharkov and Ukraine that objectively meets the strategic objectives of socioeconomic development of the country.

Keywords: competitiveness of mini-hotel, category theory, category-functorial model, life cycle, project.

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INFORMATION TECHNOLOGY FOR LOW-CONTRAST IMAGE PROCESSING IN THE SPACE OF ELLIPSOMETRIC STOKES PARAMETERS (p. 20-25)

Irina Udovik

A method for low-contrast image processing and analysis in the space of ellipsometric Stokes parameters, which can be applied to improve the quality of one-parameter and multi-parameter images is proposed in the paper. Under the method, each pixel of the analyzed image is compared with four virtual Stokes parameters, which allows naturally implement color RGB coding of results without using the pseudocolor coding procedure. The proposed results interpretation method using RGB coding based on the parameters improves the low-contrast image analysis reliability.

Experiments have shown that the most appropriate method for multispectral ensemble compression is a singular value decomposition method. Images, corresponding to the first three maximum singular values are taken as three main ("own") images. The synthesis of elliptic characteristics based on their "own" images provides a higher degree of detail of the resulting color elliptic RGB coding compared with direct RGB coding of three "own" images.

Presented information technology allows to carry out low-contrast image processing using the described methods and is designed to increase the sensitivity of visual analysis and selection of objects of potential interest.

Keywords: low-contrast image, ellipsometric characteristics, modulation conversion, normalization, orthogonalization, singular value decomposition.

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CONSTRUCTION PRINCIPLES OF COMPUTER SYSTEMS FOR REMOTE TRAINING BASED ON THE ANALYSIS OF THE VIDEO STREAM (p. 25-33)

Nhuen Hui Kyonh, Viktor Boltenev, Dmytro Maljavin

Basic construction principles of the remote training system were investigated. Operation of the system is based on the fact that the user tries to reproduce as accurately as repetitive movements, performed by the instructor. Algorithms for body movement image processing in the video stream were chosen so that the system was accessible to a wide range of users with home webcam and midrange computer. Point kinematic model of the human body movement was developed. The characteristic points of the human body in the video stream frames are determined based on the image skeletonization. According to the video stream data, for each characteristic point, its position, velocity and acceleration are calculated. Based on these data, a matrix of kinematic parameters for training and user movements is constructed. Quantitative comparison of two matrices is carried out using the Chebyshev and cosine similarity measures of vectors. Based on a comparison of the difference measures of vectors, recommendations are given to the user for correction of his movements. A prototype of the system was implemented as a software project. System testing has shown the correctness of its construction principles. Remote training system can be used in telemedicine for the rehabilitation of patients with musculoskeletal disorders, as well as remote sports training.

Keywords: remote training, model of human movement, characteristic points, skeletonization, similarity degree of movements.

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ELABORATION OF THE TRANSFORM WITH GENERALIZED COMB SCALING AND WAVELET FUNCTIONS FOR THE IMAGE SEGMENTATION (p. 33-37)

Marina Polyakova, Victor Krylov, Alesya Ishchenko

When designing systems for computer recognition of visual images, segmentation of the processed class of images is an important stage. For many applied problems, the boundaries of objects, filled with structural texture often must be determined on an image. Ex-

isting methods for solving such problems are characterized by large computational cost. An alternative is using a parallel analysis of the spectral composition of the structural texture images for reducing image processing time and applying wavelet analysis for selecting objects of a given size. To analyze the image content in several frequency bands, it is advisable to use solutions of two-scale difference equation in the space of generalized functions. The solution of this equation for most sets of its coefficients can be obtained only approximately using the method of successive approximations. In the frequency domain, successive approximations of the solution of two-scale difference equation are characterized by a line spectrum and allow to perform parallel spectral analysis of structural texture images. Therefore, it is proposed to use these functions as analyzing functions of transforms with generalized comb scaling and wavelet functions to reduce image processing time due to replacing several processing levels by one. The proposed transforms were used in developing the information technology for vessel segmentation on angiograms. By applying the transform with the generalized comb wavelet function in the vessel localization, several processing levels were replaced by one. The latter is achieved by the fact that the convolution with the generalized comb wavelet function is similar to using a set of bandpass filters. As a result of experiments, it was shown that using the developed information technology provides vessel localization quality, required for making diagnostic decisions. In this case, the processing time is reduced by 43 %, and the characteristics of detection reliability of vessel pixels are changed as follows: type I error probability is reduced by 1.22 times, and type II error probability is increased by 1.14 times.

Keywords: comb filter, structural texture, generalized function, scaling function, wavelet function.

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DEVELOPMENT OF A NEW MODEL OF SERVICE EVOLUTIONARY LEVEL IAAS/PAAS/SAAS (p. 38-41)

Nadiya Kazakova, Oleg Grabovskiy

The main benefits that can be achieved by introducing the BaaS level to the existing three-tier service delivery model for determining the appropriateness of providing IT-services to the consumer as an integrated set of transactional and other joint actions to achieve the organizational objectives. With the introduction of the BaaS level, already partially implemented offers of the MBaaS middleware are considered. It is found that the BaaS will enable end users to remotely develop and monitor business and other vertical processes in cloud structures. This will free up time for other tasks and provide

an opportunity to obtain more effective solutions for organizing businesses at lower prices. Herewith, this will increase the business flexibility without loss of services that provide communication platforms and existing information security system at the levels of IaaS, PaaS and SaaS.

Keywords: service, service delivery model, cloud structure, business, cloud computing.

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MODELS OF OPTIMAL INNOVATION DEVELOPMENT OF PRODUCTION SYSTEMS (p. 42-50)

Taisa Borovska, Irina Kolesnik, Victor Severilov, Pavel Severilov

Formulation and solution of the problem of optimal aggregation of elements of the production system “innovations, development, production” by equivalent optimal element were presented. Production system and its elements are considered as technological

resource converters. An optimal aggregation methodology, which integrates the equivalent transformations of structures of production systems and sub-optimization of subsystems was used. Generalized models of production functions – parameterized and stochastic were developed and studied. Stochastic models of parametric relations among the elements “innovations”, “development”, “production” were developed and studied. Theoretical justification of these models was performed. The new task of developing a ternary operator of optimal aggregation of the structure “innovations”, “development”, “production” was solved. Optimization variables are system resource allocation among the subsystems. The result of the operator work is the optimal equivalent production function - a data structure, in which in addition to the values of the function and appropriate resource allocations, data from previous aggregations can be preserved. The new result of the work is the information technology of developing the optimal aggregation operator for sequential structures with parametric relations in the environment of mathematical packages. The studies on the developed model, the results of which have shown the possibility of using a model of the aggregated system “innovations, development, production” for decision support were carried out.

Keywords: modeling, production function, development, innovations, binary operator, optimal aggregation.

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AUTOMATIC CONTROL OF HEAT-MASS EXCHANGE PROCESSES WITH MOVABLE DISTRIBUTED REGULATORY IMPACT (p. 51-55)

Elena Belobrova, Anton Sheykus, Valeriy Korsun

The effect of movable distributed regulatory impact on the heat-mass exchange processes in the distillation column is investigated. It is shown that appropriate solution of the distillation process control problems can be achieved only by taking into account their qualitative specificity as an object with distributed parameters and building a new class of control systems of distributed objects with movable regulatory impact.

The nature of the effect of the movable distributed regulatory impact on the controlled variables is determined. The possibility to select the allowable regulatory impact, i.e., organize heat-mass exchange processes at the right time and at a predetermined position of the distillation column is shown.

One of the main advantages of movable regulatory impact is that they allow to expand the distillation unit controllability areas.

The results can be used in developing static optimization and optimal distillation process control systems.

Keywords: automatic control, heat-mass exchange processes, distillation, distributed regulatory impact, mobile control.

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SHAPING MANAGERIAL SYSTEM BY QUALITY In PROJECT With USE the FLEXIBLE MODULES (p. 56-61)

Irina Lazko

Practical experience of some institutions in the sphere of quality management proves that a model for the project quality management system is developed mainly at the discretion of the developer, and, as a rule, based only on unified standard ISO 9001:2008 without considering special features of an industry sector, and is characterized by the variety of the obtained end result, considerable labour intensity and duration. A rather formal GMS process model is built just for certification purposes, which is insufficiently adapted to the designing and engineering requirements, not flexible enough and not capable to be quickly readjusted. Such a situation encourages to conduct a study and propose an approach to building a process-oriented project QMS model which would be flexible and to the utmost take into account the requirements of QMS normative base and industry special features. For this purpose, during the study an analysis and comparison of the requirements of normative base regulating the functioning of the project quality

management system were carried out. The degree of compatibility and possibility of integration of requirements of the compared standards determined by an expert method, that is from 0,7 to 0,9 (depending on comparative requirements), confirms the compatibility of the studied standards and possibility of their integration. Based on the results of assessment typical groups of processes (flexible modules) taking place in the system were identified. At that, a formalized description of a project QMS model was carried out using the mathematical modeling means, this model was synthesized using flexible modules which have constant, variable and alternative parts. The list of project QMS processes resulted from analysis and comparison allowed to propose a process-oriented model of the system, the elements of which are "Leadership", "QMS planning", "Effectiveness assessment", "Quality assurance processes", "Engineering processes". The proposed model can be useful for a certification, as it takes into account the requirements of ISO 9001:2008, and for self-rating of an engineering company. The use of the model in practical activities will allow you to improve the effectiveness of project QMS due to clear regulation and transparency of the processes taking place, improvement of co-operation and communications during implementation of projects as well as improvement of management performance.

Keywords: process-oriented model, project quality management system, flexible module.

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DEPLOYED MODEL OF EXTREMAL SYSTEM OPERATION FOR SOLVING OPTIMAL MANAGEMENT PROBLEMS (p. 61-66)

Igor Lutsenko

The reduced, simplified registration mathematical model of the system operation, obtained by scaling the registration signals of the basic model and determining the sum of the reduced, integrated flow rates by the input and output of the system under study was constructed.

The studies of this traditional, for today model have shown the problem, associated with the existing approach in operations identification.

As a result of using the agent model and system approach, it was found that registration model of the operation is not based on the data, actually describing the process under investigation.

The new idea of the studied process has allowed to develop a method for constructing the reduced, deployed model of the operation.

The deployed model of the operation allows to get access to data of operations at each point of the model of the operation process.

The developed approach to constructing the mathematical model of the reduced deployed operation allows more accurate identification of the operation and its use to obtain new scientific results in the field of operations research.

Keywords: operations research, model of operation, mathematical models of operations research, optimal management.

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ROBUST CONTROL METHODS OF THERMOMECHANICAL PROCESSES IN THE MACHINING OF PARTS (p. 67-73)**Anatoly Usov, Elena Bogdanova**

In designing the machine parts manufacturing process, there is a need to develop a quality control system of the working surfaces of products as a result of various phenomena, which accompany machining and significantly affect their performance. For that, robust methods that are based on the object identification under uncertainty, adaptive control methods, stabilization methods of families of automatic control system, mathematical modeling of the system can be used.

The paper presents mathematical support for modeling thermo-mechanical processes, stresses and automatic stabilization system of thermophysical phenomena in machining taking into account robust control methods. Using the method of successive approximations, the initial nonlinear heat conduction problem is reduced to an iterative process, where, on each step, the task, described by parabolic linear equation with nonlinear phase constraints is solved.

The robust system synthesis provides the guarantees of the required quality, regardless of errors and changes in the model parameters. Robust control system has the necessary quality, despite the substantial uncertainty of control object characteristics.

The presence of functional connections between the technological system parameters and thermal processes in machining allows to design a control system of quality characteristics of machined surfaces of machine parts using robust methods, based on the object identification under uncertainty, adaptive control methods, stabilization methods of families of automatic control system.

Keywords: adaptive control, robust system, thermal processes, machining, surface layer quality.

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