THE RESEARCH OF THE THREAT MODEL OF THE CLOUD KEY SYSTEMS AND PROTECTION PROPOSALS AGAINST THEM (p. 4-13)

Ivan Aulov

The threat and the intruder models of cloud services and key data management in the cloud were investigated. Based on existing standards, guidelines and publications, systematization of the main information security threats in the cloud was performed, and the formalized threat model and the intruder model for the cloud, which considers the threats to the DC support systems, hardware, hypervisor, virtualized environment, deployed cloud infrastructure, cloud resources, personnel were designed. To protect against emerging threats, it was proposed to use organizational, technical and cryptographic protection methods. In order to formalize the threat model construction process and analyze opportunities of the intruder, the intruder profile was developed. The profile includes the category of persons, the nature of their actions, the level of access and opportunities, the level of familiarization with the system, the methods and tools used and the purpose. The developed threat model of key data includes control elements of the key data in the cloud, connections between them, and the role of the user and the administrator of the cloud DC. As the main protection methods and means for the key data in the cloud, it was proposed to use secure media and cloud storages of keys, cryptographic services and HSM, secure communications, as well as secure cryptographic protocols and cryptographic algorithms. Taking into account the functioning features of the cloud as a method of a preliminary risk assessment and threat classification, it was proposed to use the threat analysis method (TAM). When carrying out a full risk analysis of the existing system, using the CHAZOP method for qualitative assessment and the Bayesian approach if necessary to obtain quantitative indicators is proposed. The research results of the threat and the intruder models may be used in the security and risk examination and assessment of cloud ITS.

Keywords: cloud, key management, intruder model, protection mechanisms, risk assessment.

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STRUCTURAL ANALYSIS OF THE INFORMATION MODEL OF THE QUALIFICATION LEVEL, NECESSARY FOR FULFILLING THE JOB (p. 14-19)

Oleg Zaritsky, Volodymyr Sudik

The main research objective is the formalization of the information model of educational-qualification level and its structural analysis. The model is considered as one component of a complex open system «Professional activity», presented by the author in the form of a functional model in his early studies.

The solution of the scientific and technical problems was achieved by using the structural analysis methodology, database design and mathematical statistics methods. The information model is presented at the infological level in the abstract ER (entity relation), and the implemented structural analysis allowed to identify the most significant elements, assess the level of mutual influence and make data reduction with a view to its simplification to three basic elements: the educational-qualification level, experience, qualification improvement.

The research results can be used in the development of information technologies and systems of classification, analysis and evaluation of professional activities, as well as for the automation of the classification and coding of technical-economic and social information.

The research is an integral part of comprehensive studies of complex open socio-technical system «Professional activity» and allows to gradually develop a model of the specified system for further algorithmization and automation of professional activity assessment using appropriate information technologies.

Keywords: infological model of educational-qualification level, structural analysis, information technology.

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DEVELOPMENT OF CLOUD APPLICATION EFFICIENCY EVALUATION CRITERION (p. 20-26)

Tamara Savchuk, Andriy Kozachuk

Using cloud computing allows to significantly improve the infrastructure support, reduce deployment time and faster adapt to changes in load with periodic peaks. The latter problem is solved by cloud application scaling that allows to change the number of involved computing resources depending on the cloud application use intensity. To solve the problem of selecting the best scaling strategy, a comparison mechanism of different scaling strategies with each other is needed. Such a comparison can be performed by calculating the developed efficiency criterion, which combines the assessment of used computing and reputational resources.

The developed criterion allows to calculate the cloud application efficiency based on information about the progress of a network request, the number of users and the cost of maintenance of cloud infrastructure. The criterion allows to compare and combine different metrics of cloud applications and can be used to compare the efficiency of cloud applications on the PaaS platform under different hosting settings using metrics that are specific to the PaaS platforms.

The paper shows that the efficiency of the brainstorming system Braintank combined with the information technology for cloud application scaling is by 10.5 % higher compared to other scaling technologies with a significance level of 0.001. Using the information technology for cloud application scaling has allowed to increase the values of the efficiency evaluation criterion from 8 to 12 % on the simulator that reproduced the load on the World Cup website.

Keywords: cloud computing, cloud application efficiency, cloud application scaling.

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DEVELOPMENT OF A MODEL AND MODIFICATION OF THE HIERARCHY ANALYSIS METHOD FOR ENERGY EFFICIENCY LEVEL ESTIMATION (p. 26-32)

Dmytro Marhasov, Yvgenij Sahno, Igor Skiter

The components of the information technology for energy efficiency level estimation of municipal buildings were investigated.

As a result of the research, the following was carried out:

1. Decomposition of the solution of the factors ranking problem in the hierarchy was performed.

2. A multi-layer model for energy efficiency estimation was developed and the factors ranking process was described.

3. The hierarchy analysis method was modified through:

– forming the consistent pairwise comparison matrices of indicators in the individual factors $A^F = \left(a^F_{ij} \right)$;

– developing a consistent comparison matrix of factors $A^F = \left(a^F_{ij} \right)$;

– determining a global criterion based on factor-indicator estimates.

Implementation of the proposed method that allows, despite a fairly large dimension of the array of indicators within a given factor, to conduct correct pairwise comparisons with achieving a specified consistency level (IY≤10 %) and determine the relative values of indicators $\{ \omega^i_1, \omega^i_2, \dots, \omega^i_k \}$ that can be trusted is of particular interest and at the same time has a positive impact.

Using the proposed method allows to organize, algorithmize and adjust the procedure of expert assessment of unlike factors and improve the quality of the results obtained to form the decision-making process.

Keywords: information technology, hierarchy analysis method, decision support, energy efficiency.

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DEVELOPMENT OF KNOWLEDGE BASE STRUCTURE OF GEOINFORMATION MONITORING SYSTEM FOR EVALUATION OF QAULITY STATUS OF AGRICULTURAL LANDS (p. 32-37)

Svitlana Kokhan, Antonina Moskalenko

Solution to the problem of information decision support for monitoring the quality status of agricultural lands was highlighted and the necessity of creating an information structure that will facilitate operational monitoring of lands, creation of integrated digital thematic maps and GIS models to reflect the current status of lands was substantiated. A set of thematic variables of geoinformation monitoring system objects for evaluating and mapping the quality status of agricultural lands, providing calculation of key indicators of the quality status of lands such as ploughing-up, forest cover, field-protective forest cover, agricultural development, factors of anthropogenic load and environmental stability was defined.

The process of developing the knowledge base structure of the geoinformation monitoring system that includes the following components: thematic variables of geoinformation monitoring system objects, sets of methods for research, data processing, cartographic representation and spatial analysis was shown. A set and composition of knowledge base libraries and geoinformation monitoring system rules – set of thematic variables, set of scales of indices, library of formulas that unify information, methods of processing and presentation of results was determined.

A set and composition of metadata, rules of spatial analysis and cartographic representation of geoinformation monitoring system objects for evaluating the quality status of agricultural lands was established. The methods and types of cartographic representation were selected, the rulesets for geoinformation analysis (classification, overlay analysis, cartometric operations), symbols and composition of the legend for each index were chosen.

The developed knowledge base structure can be a basis for creating a set of thematic maps for evaluating, updating and forecasting the status of geosystems and their components.

Keywords: geoinformation monitoring, knowledge base, geospatial data base, GIS mapping.

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SIMILARITY IDENTIFICATION ALGORITHM OF HARD-STRUCTURED DATA BASED ON SEMANTIC NETWORKS (p. 38-44)

Ruslan Tushnytskyy, Volodymyr Makar

The main disadvantage of any similarity search algorithm is its purpose. Existing algorithms are focused purely on the text as a continuous element of structural data and do not take into account the context of information that is presented in the text. This makes it impossible to use algorithms for text with a specific context. The only application of such algorithms is the texts that can be elements of a more complex object of comparison. The paper presents a similarity search algorithm of hard-structured data using semantic networks. The built semantic network takes into account all the features of the bibliographic description of the publication and is endowed with methods of comparison of its separate parts. Application of the algorithm for similarity search of bibliographic descriptions in the information-analytical system "ScienceLP" was investigated. The research results have confirmed the usefulness of the developed algorithm for effective relevant search. For the versatility of the software implementation of the algorithm, reflection-oriented programming approach was used. Such an approach allows to identify almost any object, no matter whether it is built-in or user data type. This allows the algorithm to be independent of the type of the compared object and its internal structure.

Keywords: search algorithm, bibliographic description, similarity search, semantic networks.

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DEVELOPMENT OF ONTHOLOGY BASED QUIZ GENERATOR FOR "MOODLE" (p. 44-48)

Sergiy Syrota, Viacheslav Liskin

The knowledge-based information technology, which solves the problem of automatic generation of quizzes with grouping them according to the hierarchy of domain concepts was developed.

Existing methods of ontology representation and available tools for automatic quiz generation were investigated.

Based on the analysis of formats and technologies that use existing software tools Protégé and Moodle, guidelines and recommendations for the domain ontology construction were developed. The requirements were formulated, and the class of ontologies that can be used for further processing by the proposed methods was identified. A software tool – quiz generator was developed.

Using quizzes in the educational process allows to quickly check the knowledge of large groups of students, to monitor the educational achievements, reduce data processing time. However, developing effective and verified quizzes is quite a time-consuming process, which contains a lot of routine work.

Four target types of quizzes in a closed form suitable for automatic processing were identified. It was revealed that the generated quizzes are verified, i.e. questions do not contain any errors since they were automatically generated from true statements, the generated quiz does not need to be checked for errors and the number of questions is sufficient to use not only for control but also for learning.

The developed technology will allow to increase the number of educational quizzes, thereby freeing a teacher from routine work in favor of its creative component, thus will enhance the education quality.

Keywords: e-learning, distance learning, educational content, ontology, knowledge bases.

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ROBUST CONTROL SYSTEM DESIGN OF CRUDE OIL ATMOSPHERIC DISTILLATION COLUMN (p. 49-57)

Andrii Stopakevych

The robust control system of multi-component oil atmospheric distillation column was designed. Since the dynamics of the column can not be accurately modeled, a set of models, used at different design stages of the control system was developed. In the paper, the robustness of the control system means the preservation of its high quality when connecting any model of the developed set. The big advantage of the system is the fact that it is based on a multi-dimensional digital linear-quadratic regulator and the parameters that determine the material balance of the column are used as controlled variables. Such a system is easy to implement and can successfully replace traditional control systems of oil distillation columns and modern commercial control systems, which are based on model-predictive controllers popular in the global oil and gas industry.

Keywords: distillation column, multi-component, linear-quadratic regulator, crude oil, automatic control system.

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SYNTHESIS AND RESEARCH OF AUTOMATIC CONTROL SYSTEMS OF PROPULSION-STEERING COMPLEX OF SUBMARINE VEHICLE (p. 58-63)

Vladimir Blinstov, Sergey Volyanskiy

A generalized block diagram of the PSC ACS based on the BIM in the horizontal rectilinear motion of the SV was developed, based on which, depending on the controlled variable, control laws to stabilize the angular rotation velocity, the propeller stop of the SV and the velocity of the SV in its horizontal rectilinear motion were obtained. The structure, operation algorithm and computer program for implementing adaptive PID controllers and fuzzy controllers were designed. Adaptive PID controllers and fuzzy controllers for high-precision PSC ACS based on BIM in the horizontal rectilinear motion of the SV were synthesized. A specialized simulation complex (SSC) to investigate the ACS effectiveness of electric drives of any type of current, which includes metrologically certified training and research laboratory tool "TS-1Test stand" was designed, created, developed, implemented into production and training process. The PSC ACS based on the BIM in the horizontal rectilinear motion of the SV was developed, implemented and investigated on the SSC.

Keywords: barounloaded induction motor, control efficiency, simulation, propulsion-steering complex, control quality indicators, specialized simulation complex.

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