ABSTRACT AND REFERENCES

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DEVELOPMENT OF TECHNICAL COMPONENT OF THE METHODOLOGY FOR PROJECTVECTOR MANAGEMENT OF EDUCATIONAL ENVIRONMENTS (p. 4-13)

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We propose tools for planning and administration of the technological component of the methodology of project-vector management of educational environments that were implemented in the applied information technology of planning and administration of activity of subjects of the educational environment. The activity of subjects of educational environments in this methodology is represented as a set of projects of different duration and with different needs for resources. The authors proposed the combined method for planning of information-product projects, which includes calculation of early and late terms of completion the work without regard to resources distribution and simulation of resources distribution among the works according to the Monte Carlo method. The result of application of this method is formation of the projects' implementation plan, which is acceptable by resources allocation and close to the optimum by the time of projects' implementation.

The method for calculation of administration vectors that represent the projects' motion in the project-vector space was proposed. These vectors are constructed based on a set of scores of various aspects of development of projects of subjects of educational environments.

The means for compensation of the impact of unforeseen situations on implementation of projects of subjects of educational environments were considered. Such tools include creation of reserves of resources and time to overcome areas of space, in which resistance occurs, adjustment of the path trajectory so that it should pass through the area of least resistance. Formulae for calculation of resistance to motion of a project in the project-vector space, which allow estimating the necessary reserves of resources and time for implementation of projects of subjects of educational environments, were proposed. The formulae are intended to calculate resistance to motion of projects in the project-vector environment, based on the speed of motion of a subject or an object for a certain project, taking into account coefficient of resistance to motion in the determined direction.

Keywords: educational environment, project-vector management, project-vector space, administration vector.

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ELABORATION OF METHODOLOGY FOR DESIGNING A PUBLISHING AND PRINTING WEB PORTAL (p. 14-22)

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An analysis of features of designing publishing and printing web portals was performed. Based on these features, the key stages of the methodology of designing publishing and printing web portals have been established. It was found that because of the heterogeneous content of the publishing and printing portal as a complex internet project, it is advisable to adhere to the stage-by-stage and complexity conditions. Because of this circumstance, a necessity of working out a scenario of user interaction with the web portal arises. Solution of this issue is offered in this study.

A matrix of logical interrelation was constructed, which makes it possible to study the cause-and-effect relationships of the basic functions performed by the publishing and printing portal. Based on the cause-and-effect relationships, structuring of the resource sections was made. By combining the tools of cluster, multivariate and discriminant analyses, the main sections of the publishing and printing web portal were defined and the content was formed. As a result, the structure of sections of the publishing and printing web portal was formed including reference, communicative, supplementary and information sections.

The mechanism of ensuring safety of the publishing and printing web portals which provides reliable protection of the portal against information threats was proposed. To determine this mechanism, factors influencing enhancement of the publishing and printing portal safety, the matrix of pairwise comparison of safety factors and the matrix of weight coefficients of the safety factors were established.

Keywords: publishing and printing web portal; publishing and printing; scenario of interaction, methodology.

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ANALYSIS OF STATISTICAL METHODS FOR STABLE COMBINATIONS DETERMINATION OF KEYWORDS IDENTIFICATION (p. 23-37)

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The study has solved the task of making comparative analysis and choosing an optimal statistical method to determine stable word combinations while identifying keywords to process English-language and Ukrainian-language Web-resources. The effectiveness of the method directly proportionally depends on the quality of linguistic analysis, of Ukrainian and English texts, respectively, based on the technology of Web Mining and NLP. A decomposition of methods of linguistic analysis was performed to determine the impact on the quality of forming stable word combinations as keywords. The features of the method are the adaptation of the morphological and syntactic analyses of lexical units to the peculiarities of Ukrainian-language words/texts.

To determine stable word combinations effectively, it is essential to exclude functional words (stops or references), pronouns, numerals and verbs because they are not related to the subject and content of a published work. A set of stable word combinations as keywords is determined by qualitative morphological and syntactic analyses of relevant texts. The set of the identified stable word combinations is used further to compare and determine the degree of the text relevance to a specific topic or user request. The internal "dynamics" of forming a set of stable word combinations as keywords was investigated in the study depending on the statistical method applied to the texts. The obtained results have been verified.

The study has produced results of the experimental testing of the proposed content-monitoring method for determining stable word combinations to identify keywords in the processing of English-language and Ukrainian-language web-resources of the technical content based on Web Mining technology. It has been determined that the authors of published works often identify the keywords that are far from being considered. It has also been proven that the quality of the result is influenced by the quality of linguistic analysis of texts and subsequent filtering. Further experimental research requires approbation of the proposed method for determining keywords for other categories of texts – scientific, humanitarian, belletristic, journalistic, etc.

Keywords: stable word combination, NLP, Information Retrieval, SEO, Web-mining, statistical linguistic analysis, quantitative linguistics, heading.

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EXPLOITING THE KNOWLEDGE ENGINEERING PARADIGMS FOR DESIGNING SMART LEARNING SYSTEMS (p. 38-44)

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Knowledge engineering (KE) is a subarea of artificial intelligence (AI). Recently, KE paradigms have become more widespread within the fields of smart education and learning. Developing of Smart learning Systems (SLS) is very difficult from the technological perspective and a challenging task. In this paper, three KE paradigms, namely: case-based reasoning, data mining, and intelligent agents are discussed. This article demonstrates how SLS can take advantage of the innovative KE paradigms. Therefore, the paper addresses the pros of such smart computing approaches for the industry of SLS. Moreover, we concentrate our discussion on the challenges faced by knowledge engineers and software developers in developing and deploying efficient and robust SLS. Overall, this study introduces the reader the KE techniques, approaches and algorithms currently in use and the open research issues in designing the smart learning systems.

Keywords: Knowledge engineering, Smart Learning Systems, Artificial Intelligence, Intelligent Agents, Data Mining, Case-Based Reasoning, Smart Computing.

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ORGANIZATION OF INFORMATION SUPPORT FOR BUSINESS PROCESSES AT AVIATION ENTERPRISES BY MEANS OF ONTOLOGICAL ENGINEERING (p. 45-55)

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We propose using the deductive principle of inference, which takes into consideration child relations between concepts of a subject domain in the process of forming a reasoning chain and, thus, ensures correctness of knowledge, contained in an ontological system. In this case, an ontological system is directly the intelligence core of a decision support system for organization of business processes at an aviation enterprise. For implementation of the declared principle, three methods of knowledge manipulation in the environment of an ontological system were proposed: bottom-up, top-down and combined, which implies the alternating use of the first two methods. Application of the combined method gives the possibility to eliminate knowledge incompleteness and inconsistency. Formalization of inference process on the knowledge in the environment of an ontological system with the use of the proposed methods is based on a description of the internal relations between concepts, integrating a set of concepts and fields with the help of the language of operational semantics, as well as on the introduction of external relations that characterize structural relations of concepts, including hierarchical relations of aggregation and synthesis.

The possibility of re-using, that is the multiple use of ontological information structures in making decisions on organization of business processes at aviation enterprises will make it possible to enhance efficiency of production decisions and their operative making.

The obtained results create the methodological basis for the development of software of inference organization on knowledge directly in the environment of ontologies, which is proposed to use as part of the core of production DSS.

Keywords: aviation enterprises, language of operating semantics, decision support system, ontological engineering.

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DEVELOPMENT OF A METHOD FOR THE EXPERIMENTAL ESTIMATION OF MULTIMEDIA DATA FLOW RATE IN A COMPUTER NETWORK (p. 56-64)

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We have developed a method for the experimental estimation of rate of multimedia data stream in a computer network based on the methods of mathematical statistics. The method, in contrast to the existing ones, is based on considering the rate of multimedia data stream as a random variable that obeys the normal distribution law.

When designing computer networks, in order to estimate the required throughput, mathematical streaming traffic models are applied. Such an approach is justified when the constraints of mathematical models are met, such as stationarity, ordinarity, and the absence of aftereffect for the Poisson stream of packets.

Under actual conditions, estimates for characteristics of data flow, derived using existing models, may prove to be too conservative as a result of failure to comply with conditions of stationarity of the packet stream.

An alternative way for solving a given task is the development of a statistical experimental method for estimating the rate of multimedia data stream in a computer network. The proposed method makes it possible to derive the values of mathematical expectation and a standard deviation in data transmission rate, as well as to estimate consistency of the hypothesis about a normal character of the distribution law of multimedia data flow rate.

The experimental estimates are given for the multimedia data stream rate in a computer network at different values of resolution and frame rate of the video. These results showed that the experimental estimates exceed analytical data by 3...20 %.

The values of multimedia data flow rate estimates, acquired using the proposed method, could be used to estimate the load of segments in the designed computer network, as well as to explore the throughput of segments in the existing computer network.

Keywords: network traffic analysis, statistical processing of results of experiment, data flow rate.

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DESIGN OF A SET OF NONLINEAR CONTROL SYSTEMS OF THE ARC PVD IONPLASMA INSTALLATION (p. 65-74)

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Control systems over the set of technological processes of the installation for ion-plasma application of coatings on metal cutting tools are developed. The purpose of the development is the need to improve the quality and durability of manufactured tools by maintaining more accurate technological parameters of the installation. The result of our research is the developed new nonlinear models of control systems over all stages of operation. At the stage of ionic cleaning, a temperature rise in tool is maintained in line with the set linear program by enabling and disabling the arc discharge. Control system provides for a deviation from the program by ±4.5 K, which is 4 times less than the standard value. At the stage of applying a coating on the tool, the temperature is precisely stabilized in a vacuum chamber by a continuous change in voltage at the substrate, as well as pressure in it by a change in the flow rate of nitrogen into the chamber. Under the action of maximal disturbances, a deviation in pressure, 0.037 Pa, and in temperature, 0.45 K, is ensured. At the stage of cooling, a decrease in temperature is achieved in line with the program by changing the feed of nitrogen into the chamber. Under the action of maximal disturbances, a maximum cooling rate of 0.22 K/s is ensured, which is also better than the standard value. Thus, the application of the developed control systems allowed us to considerably improve tool resistance compared to the installations that are used at present. It is important that the developed control systems are easy to implement and make it possible to ensure high quality of the obtained tools.

Keywords: coating, Arc-PVD, nonlinear control system, metal cutting tools, cathodic arc deposition.

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ANALYTICAL STUDY OF STARTING CURRENT OF THE INDUCTION MOTOR STATOR (p. 75-81)

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In a three-phase coordinate system, the induction motor is described by a system of nonlinear differential equations of the eighth order, which in a general case does not have an analytical solution. The system of IM equations can be considerably simplified for the starting mode with a stationary rotor. When analyzing the specified operating mode, periodic coefficients in the IM equations that depend on the angular position of the rotor are transformed into constant magnitudes. Further simplification of the system of IM equations implies the exclusion of motion equations, which is also associated with the accepted assumption about the immobility of the rotor. We assume that the stator of IM is connected to a power line according to the circuit without a zero wire. This makes it possible to exclude from the common system two equations of electrical equilibrium of the windings, for one stator and one rotor winding, by applying the Kirchhoff's first law. As a result of the performed transformations, we obtained a simplified system of IM equations with a stationary rotor, which, in contrast to the complete system, is a system of linear differential equations of the fourth order and is presented in the Cauchy form, which can be solved analytically.

Using the methods of analysis of dynamic objects in a state space, we obtained expressions for the coefficients of IM characteristic equation and its roots, as well as for the matrix of IM transfer functions when the rotor is stationary. An analysis of expressions for the roots of the characteristic equation shows that the character of roots of the IM characteristic equation depends on the initial angular position of the IM rotor. This is explained by the fact that a change in the initial angular position of the rotor changes the magnitude of mutual inductance between separate windings of IM, which affects the processes of energy transfer between stator and rotor windings.

Keywords: induction motor, three-phase coordinate system, state space method, characteristic equation, matrix of transfer functions.

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