ABSTRACT AND REFERENCES

INFORMATION TECHNOLOGY. INDUSTRY CONTROL SYSTEMS

"LIFELONG LEARNING" IS A NEW PARADIGM OF PERSONNEL TRAINING IN ENTERPRISES (p. 4-10)

Viktor Gogunskii, Olexii Kolesnikov, Kateryna Kolesnikova, Dmytro Lukianov

World practice to overcome the lack of knowledge and meet educational needs under the terms of career growth and personal improvement and development is based on the modern paradigm of continuous postgraduate education lifelong learning (LLL).

In the context of learning management, the analysis of features and synthesis of the structure of interaction of the basic process entities as knowledge holders were performed. Referring basic knowledge holders team, customer, training and in-depth knowledge systems to certain discrete states, which the system may take, allows representing the system using a Markov chain with four discrete states. A directed graph of the Markov chain reflects the secondary projection of a communication on the knowledge space rather than the physical interaction of the knowledge holders. Markov chain transition probabilities for the project environment define its characteristics that vary in discrete time by the steps in the form of a set of state probabilities. Cognitive properties of the model which is based on the Markov chain makes it possible to set some specific values of the transition probabilities of the system.

The results obtained are the justification for continuing training and acquiring additional education of personnel in the deficit of knowledge that is necessary for the implementation of unique projects. Using the developed cognitive model of the interaction of knowledge in project management, the paradigm of "lifelong learning" was justified. The knowledge management structure includes four fundamental entities: the customer, the team, training and in-depth knowledge systems of the knowledge owners. These entities are in a constant process of knowledge sharing. The systems of training and in-depth knowledge play a role of generating new knowledge, which was absent in the project environment. Continuing education ideally is aimed at balancing between the needs of society and the motivational structure of personality that actually should be implemented through the mechanisms of the influence of education on the socialization of the individual.

Keywords: learning; paradigm; continuity; project management; communication; Markov chain, knowledge holders, transfer.

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ENTERPRISE INFORMATION PLANNING – A NEW CLASS OF SYSTEMS IN INFORMATION TECHNOLOGIES OF HIGHER EDUCATIONAL INSTITUTIONS OF UKRAINE (p. 11-23)

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For the adaptation of the Ukrainian educational sphere to the realities of the modern world and the improvement in the education quality in Ukraine, the informatization of

higher school is a necessity. The analysis of informatization of higher educational institutions of the western countries showed that the development of higher school is directed toward the creation of the united digital ecosystem with the common curricula, teaching staff and students. The studies, which will create conditions for uniting the information systems of institutes of higher education of Ukraine into this ecosystem, were carried out. The classification of the information systems of institutes of higher education was made and a three-component model (information technologies, actors and environment) was suggested. The analysis of the information exchange between these components was carried out. It was shown that the more actors are involved in providing information, the later it will be obtained by the end user and the higher probability of the error is. Therefore, it was proposed to develop information management system of an enterprise – Enterprise Information Planning (EIP), which can be used for informatization of institutes of higher education in Ukraine. The functions were developed and the EIP capabilities in the information management of an institute of higher education were determined. The method of reducing the time of processing requests to obtain the information based on planning the actors' cooperation in EIP was proposed. Its essence lies in planning and controlling the actions of actors in the process of working with the information resource of EIP. The example of fulfilling requests to obtain the documents, which illustrates the advantage of the approach to informatization of an institute of higher education based on the EIP, was given.

The algorithms, functions, the architecture and the interface of EIP were shown. The selection of a administrative superstructure over the means of information systems is their characteristic feature. The description of the EIP advantages and disadvantages was given. In particular, the possibility of localization of the information management functions IS should be distinguished. The disadvantages include additional expenditures of an institute of higher education for their creation. EIP makes it possible to solve information management problems at other enterprises, the work of which is connected with the need for managing considerable information resources.

Keywords: digital ecosystem, institution of higher education, information resources management system.

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DEVELOPMENT OF MODELS FOR IMPUTATION OF DATA FROM SOCIAL NETWORKS ON THE BASIS OF AN EXTENDED MATRIX OF ATTRIBUTES (p. 24-34)

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Missing data cause various problems when processing and analysing real-world datasets. In this paper, we consider the structure of data from social networks' accounts and introduce models of imputation and their ensembles designed for this area.

We have analysed the structure and strength of correlations between data from social networks' accounts and suggested an approach to imputation on the basis of an extended matrix of attributes. We have justified a step of preliminary clustering when processing missing data, which helps overcome the problem of a large number of unique values in analysable variables. We have designed models of imputation on the basis of association rules, a random forest, a support vector machine, a neural network, and an EM algorithm while using preliminary clustering and an extended matrix of attributes. We have compared the performance of these models with the most popular method of imputation "Most Common Value" (MCV), which is usually integrated into statistical packages. These results demonstrate that the MCV method is not well suited for data from social networks' accounts in terms of two evaluation criteria.

Using the suggested models, we have developed ensembles of models for imputation of nominal and numerical data types. We have shown that the ensembles of the models can handle missing values more effectively and stably in terms of the concerned evaluation criteria in comparison with the single models.

Keywords: imputation of data, an extended matrix of attributes, an imputation model, an ensemble of models.

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DEVELOPMENT OF A COMPUTER SYSTEM FOR GENERATING SEMANTIC TEMPLATE OF A GROUP OF DOCUMENTS BY USING LATENT SEMANTIC ANALYSIS (p. 35-41)

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The CS was developed by means of the Python programming language to generate a semantic template of a group of documents by the LSA method. The system contains eight software modules, each performs one stage of the LSA. The control module of the frequency word-document matrix and the measuring module of semantic distance between the template documents are unique. Adjustment of CS to the contents and structure of the document templates is performed by changing a set of modules.

According to the research, the frequency matrix normalization enhances the resolution of the semantic template generated by using the LSA. It is proved that the removal of individual words improves the resolution of the generated semantic template and does not affect the semantic content. Application of semantic proximity of documents, the cosine of the difference of angles between the vector of a group of basic words and vectors of documents for evaluation allows increasing the resolution of the generated semantic template. To ensure the continuity of the LSA, the module of the frequency matrix analysis for compliance of excess (or equality) of the number of words over the number of documents was introduced in the CS. In the event of a mismatch, the module starts over the LSA process with a new set of words and documents after removal of the inappropriate document and related words.

Keywords: computer system, latent semantic analysis, resolution, frequency matrix, semantic distance.

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FORMATION OF A REFERENCE MODEL FOR THE METHOD OF INVERSE DYNAMICS IN THE TASKS OF CONTROL OF UNDERWATER COMPLEXES (p. 42-50)

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Main requirements to the systems of automatic control of underwater complexes are specified. Main points of the synthesis of control systems by the method of inverse dynamics are given. The drawbacks of the method of inverse dynamics are defined, which consist in the limiting of the choice of the structure of a reference model and the necessity of bringing a mathematical model of the object of control to the view of a reference model.

A mathematical model of an underwater complex is developed for the synthesis and study of the systems of its control that simulates a one-dimensional motion of an underwater vehicle under conditions of perturbing influence of a tether cable.

Impossibility of the use of the method of inverse dynamics in the classic form for the synthesis of automatic control systems of underwater complexes is determined because their mathematical models contain elements that are set in arbitrary form.

The method of inverse dynamics was improved by applying the principle of decomposition of a reference model, which boils down to its formation as a set of reference submodels based on the actual structure of an object.

Decomposition of a reference model makes it possible to synthesize high-precision control systems of underwater complexes by the method of inverse dynamics and to set reference submodels of dynamics of phase coordinates of an object in the form of arbitrary functions of time.

Automatic control system of a one-dimensional motion of an underwater complex was synthesized by the method of inverse dynamics using the principle of decomposition

of a reference model. The author proposed three variants of a reference model of an automatic control system. The first variant makes it possible not to execute conversion of a mathematical model of the object to the view of a reference model. The second and the third variants are formed on the basis of the structure of a mathematical model of an object, presented in the form of Cauchy. This allows setting the dynamics of transition processes for each phase coordinate of the object in the form, accordingly, of differential equations of the first order and arbitrary functions of time.

Computer simulation of an automatic control system revealed that the transitional process of eliminating an error of the controlled magnitude corresponds to the reference one. After eliminating the error, the controlled magnitude strictly follows the set one without delay.

Keywords: reference model, method of inverse dynamics, automatic control, underwater complex.

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DEVELOPMENT OF EXECUTIVE SYSTEM ARCHITECTURE OF THE CONVERTING CLASS (p. 50-58)

Igor Lutsenko, Elena Fomovskaya, Olga Serdiuk

The issue of the control purpose achievement and the related issue of optimization of technological processes are closely connected with development of the architecture of the controlled system. So, the structural optimization problem solution can lead to such architectural concept at which the solution of the problem of parametrical optimization becomes impossible in principle. Complexity of the solution of similar problems consists in the fact that for today there is no standard idea of what is a "system", "controlled system", "simple system", "complex system", etc. That is, the issue of what is generally considered as a system is conceptually unresolved.

Therefore, the reference point, as a standard of a system, were the following postulates: all functions of an object have to be carried out automatically, the received object has to provide interactive interaction with other objects, the object has to carry out only one basic technological function (heating, crushing, movement, sorting, etc.).

For testing the operability of architectural concepts, a specially developed program designer was used. As the result of research, the internal structure of a single-product system of the converting type has been developed. The entire set of the interconnected mechanisms is presented in the form of five subsystems. Each subsystem carries out the intrasystem function. Definition is given to a system of the converting type and its subsystems.

The use of the offered architecture of the converting system creation allows using the block principle of systems creation of this class. Besides, such principle of allocation of subsystems makes them robust as at failures in the functioning of the registration and optimization subsystems they can be disconnected. At the same time, the loss of optimizing opportunities won't lead to the loss of operability of another part of the system and the entire system environment.

Keywords: system, converting system, coordination subsystem, control subsystem, registration subsystem.

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NON-LINEAR RECURRENT ANALYSIS OF THE BEHAVIOR OF A COMPLEX TECHNOLOGICAL OBJECT (p. 59-65)

Vasilij Kyshenko, Anatoly Ladanyuk, Maryna Sych, Olena Shkolna

For the efficient management of a technological complex of a sugar plant, based on the synthesis of synergetic managing strategies, it is necessary to perform a number of experimental studied by methods of nonlinear dynamics. The applied method is built on such a property of a complex system as recurrence. This method of analysis is based on the representation of the properties of a complex object of management in the form of geometric space-time structures and their quantitative assessments. It, accordingly, makes it possible to carry out a prompt analysis of its behavior for making resource saving management decisions.

When creating information management systems of complex objects there is always a task of assessing their state. This is caused by a continuous change in both the external environment and the object's parameters, which is relevant for a technological complex of a sugar plant.

It was established that the character of the processes that occur in the technological complex of a sugar plant is predetermined by the intermittency in behavior while it is also subject to laws of the theory of dynamic chaos.

Chaotic behavior of technological objects was explored by the methods of nonlinear dynamics, which allowed us to determine qualitative and quantitative assessment of deterministic chaos. This, in its turn, makes it possible to develop of efficient systems of synergetic management that ensure maximal use of own resources of the object of management owing to the phenomena of self-organization.

Keywords: recurrent plots, time series, sugar plant, synergetic management, nonlinear dynamics.

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