

EVALUATION METHOD OF INFORMATION MODELS OF OBSERVED PROCESSES IN COMPUTER NETWORK (p. 4-11)

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The problems of remote data collection about the state of various network components always appear during computer network administration. This leads to increased levels of official traffic in communication channels, which may adversely affect the user data transmission quality. One of the ways to solve the problem is an approximation of the processes, observed when computer network monitoring. This method reduces the number of measurement points by replacing the measured values by the approximated ones. For effective approximation, it is important to develop adequate approximation models of the observed processes.

A formalized approach to the evaluation of previously proposed information models of the observed processes in a computer network was developed in the paper. These models describe the behavior of the observed processes in the form of a preselected set of numerical and mathematical characteristics. Using the considered information models allows to form a sufficiently detailed picture of the behavior of the observed processes to select an adequate approximating model. For evaluating models, a method, representing a sequence of steps for the analysis of the observed processes to calculate the parameters of the models was developed. The advantage of the method lies in its adequacy, flexibility, ease of implementation and low computational cost. As a practical example of using the developed method, evaluation of models for the two observed processes in the computer network: the process "established TCP connections" and the process "disk data recording/reading flow rate" was performed. The results show the feasibility of the proposed method.

As a result of the research, it was found that the stages of evaluating the information models can be coordinated with the general network monitoring organization scheme. Weaknesses of the existing rules for estimating the parameters of the models were identified and improved rules were proposed. In particular, the accuracy of estimating the linearity, dynamics and lifetime of the observed processes was improved.

The obtained results allow to approach solving the problem of selecting an effective approximating model for the observed processes in the computer network.

Keywords: approximation, computer network monitoring, controlled process, Windows Management Instrumentation (WMI).

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DEVELOPMENT OF MULTIBASE DATA STORAGES ON THE BASIS OF DATA AND QUERIES STRUCTUREDNESS (p. 11-17)

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The study focuses on building multibase data storages that consider a correlation between the data properties and performed queries. This type of data storing has been neither viewed as an approach nor researched before. Lack of attention especially concerns presentation of data by various models for optimizing query response. We suggest a method of designing multibase data storages on the basis of data structuredness, which allows posting the reference data in storage media the data models of which facilitate performing queries on them. The efficiency of the designed data storage is optimized on the basis of the statistics on queries processing and consists in storing data as well as saving the data in storage media with the help of indexing, materialized submission, fragmentation, and merger. We have studied both the impact of design phases and optimization on storage performance and the parameters of the modified genetic algorithm, including the threshold of gene adaptation.

The research has proved that application of the suggested approach increases the integral index of query processing by 10 %. The storage building time can be reduced to 50 %, which significantly impacts data storage building of a huge amount of data. An important advantage of the approach is flexibility: any storage media and optimization mechanisms can be used while applying the suggested models.

Keywords: multibase data storages, building, data structuredness, queries, genetic algorithms, gene-based adaptation of search.

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FORMATION OF THE STRUCTURE OF SOCIAL-INFORMATION INTERFACES AS A SOLUTION OF THE RESPONSIBILITY ASSIGNMENT PROBLEM (p. 17-23)

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The concept of social-information interface that is used in various ways by HEI divisions was defined in the paper. Information activity strategies of the higher educational institution in the Internet social media, namely monitoring, analytical, representative, active, educational were highlighted and described.

Importance indicator of the generator, which is the basis for the HEI information activity coordinator to make a decision on

the implementation of social-information interface and prioritization when working with it and building strategies and algorithms of response to external influences on the HEI information image on the Internet, including identifying priority directions of activity and resource planning, as well as integrated assessment of the HEI positive image, was determined.

A mathematical description of the problem of assignment of responsibility of the divisions for generators, based on the formal description of the structure of HEI and generators was formulated.

A comprehensive estimate of the overall predictive efficiency of information activity of the division in the generator that includes communicative and predictive efficiency was defined.

Keywords: generator, integrated indicator, divisions in generators, higher education institutions (HEIs).

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INFORMATION TECHNOLOGY FOR PERFORMANCE MANAGEMENT OF INDUSTRIAL PRODUCTION (p. 24-30)

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A methodology for the automated performance management of life cycle processes of industrial products in the form of a set of data management methods, developed mathematical models, knoware, dataware and software, complex information, functional and simulation modeling is proposed. On the example of preproduction engineering processes, formal presentation of information objects “Product”, “Resource”, “Process” is shown, their key activity indicators and key performance management indicators are singled out. After the peer review and valuation of indicators, a model of the target function for determining the level of the management performance indicator was obtained. The method for assessing the PE quality, which, unlike existing ones, determines the effectiveness of processes executed in a particular period of time, calculates the PE stability and determines the necessary corrective actions was developed. A new concept of the management index was introduced and its mathematical model was presented. The mathematical model for determining the required number of specialists was developed. A functional, information and simulation modeling was carried out. The method of the PE analysis and performance management was presented. Architectural solutions of the developed information technology, development features of dataware and software and the practical use of the results were described. The possibility of the automated performance management of the industrial production of a particular enterprise in real-time with the assessment of production processes and subsequent adjustment was proved. Specialists and managers of enterprises can obtain tools to control basic production activity indicators of their enterprises.

Keywords: information systems, performance indicators, preproduction engineering, performance management.

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IDENTIFICATION OF TARGET SYSTEM OPERATIONS. DETERMINATION OF THE VALUE OF THE COMPLEX COSTS OF THE TARGET OPERATION (p. 31-36)

Igor Lutsenko

Currently, the increase in financial returns from economic operations is constrained in view of the lack of a single efficiency criterion, which allows uniquely identify the business operation by their main feature – the possibility of obtaining the maximum value added (profit).

One of the main scientific steps on the way to obtaining the formula of efficiency is developing the “resource intensity” indicator. The development of this indicator was based on the model of the deployed operation and determination of the time of the actual completion of the target operation, which does not coincide with the traditional notion of the time of completion of economic operations.

For processes with distributed parameters, an expression for determining the resource intensity using numerical methods was derived.

For economic operations, which can be reduced to simple operations, an analytical expression of resource intensity was obtained.

Using mathematical modeling methods it was revealed that in the case of a fixed value of expert (cost) estimate of output products of the operation, the minimum resource intensity of the operation indicates a maximum efficiency operation with respect to the target product of the operation.

Development of the resource intensity of economic operations is the final step towards the development of cybernetic (interdisciplinary) efficiency indicator that allows to maximize the value added (profit) of economic operations.

Keywords: target operation, complex costs, resource intensity of target operation, costs of operation.

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THE METHOD OF A THREE-DIMENSIONAL INTEGRAL FUNCTIONAL IN A STUDY OF MULTIPARAMETER OBJECTS OF CONTROL AND MANAGEMENT (p. 36-43)

Josef Stentcel, Elena Prokaza, Konstantin Litvinov

Technological processes of the chemical, oil processing, food processing, and other industries are based on transferring the impulses of mass, energy, and movement from their source to a rheological transition zone responsible for substance conversion. The processes are researched on the basis of the theory of rheological transitions and the zero gradient method. We have proved that such technological processes can be described by means of the Dirac integral impulse delta-functions (δ functions), which allows solving nonlinear equations of energy and mass transfer in an analytical form. We have revealed that such technological processes are characterized by three interrelated coordinates: incoming heat or material flows, time during which substances stay in the processing facility, and output coordinates that determine productivity and quality of the manufactured products. The multiparameter processes are characterized by initial coordinates, among which there exist extreme dependencies. The extremes used to be typically determined by equations of two-dimensional criteria that could not secure an optimal technological process on the basis of input and output coordinates and the time during which substances stay in the processing facility. We have proved that optimal correlation between the parameters can be achieved on the basis of a three-dimensional integral functional the extremes of which are the functions of the Lagrange, Pontryagin and Euler criteria. We have suggested analytical equations for calculating extremes of the technological process, which facilitates maximum efficiency of the process at minimum energy and material expenses.

Keywords: technology, control, management, transfer, rheology, transition, diffusion, convection, extreme, optimization.

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OPTIMAL CONTROL OF SYSTEMS ENGINEERING. DEVELOPMENT OF A GENERAL STRUCTURE OF THE TECHNOLOGICAL CONVERSION SUBSYSTEM (Part 2) (p. 43-50)

Igor Lutsenko

At present, technological subsystems are usually hard-coded to produce a consumer product with a certain performance, and efficiency, which is defined either by the factory settings, or determined by the technologist's view on the mode, suitable for this or that equipment.

This is predetermined by a number of factors, however, features of the architecture of the technological line, which prevent the possibility to independently vary the feed of raw and energy products, as well as the lack of built-in capabilities to assess the absolute value added of the technological operation and effectiveness of the technological operation are determining ones.

There are no such shortcomings in the technological subsystem with a batch feed of raw products, the architecture of which is developed in the framework of this publication.

Independence of the performance change from external demand is ensured by the presence of the own buffering system of the finished product. Built-in capability to obtain data on economic parameters of the technological operation provides implementation of a full parametric optimization according to the resource efficiency criterion.

The maximum number of degrees of freedom together with the ability to assess technological operations opens up the practical possibility of implementing new, previously unavailable in terms of effectiveness technologies in production.

Keywords: technological subsystem, optimal technological subsystem structure, process optimization.

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DESIGN OF TRACKING INVARIANT SYSTEMS BASED ON THE EQUIVALENT ROBUST CONTROL (p. 50-55)

Ghazanfar Rustamov

An approach to designing invariant, with respect to external *disturbances*, control systems is proposed. Unlike the classical scheme, it does not require perturbation measuring. The possibility of unlimited increase in the robust controller gain without stability loss allows to reduce the effect of perturbations to an arbitrarily small value. This ensures high tracking accuracy of the reference trajectory and speed for a wide class of perturbations. In the limit, the system is described by the equation of the hyperplane. This feature allows to define the robust controller settings using the methods of linear control theory, in particular, the method of “modal control”. The disadvantages of the method include using derivatives of the output to generate the PD-controller and strengthening high-frequency noise with direct

access to the controller. The effectiveness of the proposed method is confirmed by solving the model problem on Matlab/Simulink.

Keywords: control system, invariant system, uncertainty, Lyapunov function, robust controller, perturbation.

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SYNTHESIS OF SEARCHLESS ADAPTIVE SYSTEM BASED ON LYAPUNOV FUNCTION USING STATE OBSERVER (p. 55-60)

Andrii Pysarenko, Maksym Tataurov

Searchless adaptive control system was studied and synthesized based on a Lyapunov function by a transient object under noisiness of measured values using state observer. The system adapts to the control object, regardless of whether the control object has static or dynamic characteristics. Additionally, the noise effect on the adaptive system behavior in the long run was investigated. The designed adaptive inference correction controller allows

to adjust the control object inference and eliminates the static error of inference. State observer, which is based on the reference model restores the control object state vector. Even with significant object root deviations and random variables, adaptive system adapts the control action values and sets the control object inference to the desired value with the desired transition process time. The model was developed in the MATLAB/Simulink software package. Based on simulation, study of efficiency of the proposed model with different changes in the control object parameters was carried out.

Keywords: adaptive control systems, Lyapunov function, state observer, MATLAB.

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