Summaries

UDC 62-50

Avetisyan A.G., Simonyan S.O., Kazaryan D.A.
SOLUTION OF LINEAR PROBLEM OF OPTIMAL SPEED IN THE FIELD OF PUKHOV'S DIFFERENTIAL CONVERSIONS

The possibility of solving the optimal speed problems on the basis of the newest symbolic method of Pukhov's differential conversions has been shown. The dynamic problem comes to the problem of nonlinear programming equivalent to it, which is easily to be solved, by the differential conversions. A model example was examined and the proposed approach efficiency was shown.

UDC 519.233.22

Malyarenko A.A.
ONE-STEP SEQUENTIAL PARAMETER ESTIMATION OF NONLINEAR DISCRETE TIME STOCHASTIC SYSTEMS

The one-step sequential parameter estimation procedure of nonlinear discrete time regression processes has been constructed and studied. The constructed procedure was applied to two-dimensional autoregressive model with drifting parameters and two-dimensional AR/ARCH model.

UDC 004.94

Pogrebnoy V.K., Pogrebnoy A.V., Pogrebnoy D.V.
MAPPING THE DYNAMICS CONDITIONS OF CONTROL OBJECT FUNCTIONING TO THE REALTIME SYSTEM MODEL

The technique of mapping the dynamics conditions of control object functioning to the realtime system model has been proposed; the latter is represented by a modular architecture on structured modeling language in the form of dataflow graph. It increased considerably the model constructivity and extended the possibilities of determining dependences between the model dynamics parameters and the design system characteristics. The formal approaches of estimating the influence of model dynamics parameters on total volumes of consuming the system computational resources – CPU time, storage, network bandwidth were developed.

UDC 004.94

Pogrebnoy V.K., Pogrebnoy A.V., Pogrebnoy D.V., Dorofeev V.A.
THE ANALYSIS OF THE REALTIME SYSTEM MODEL INFLUENCE ON ABILITY OF PERFORMING THE APPLIED FUNCTIONS AT THE DESIRED DYNAMICS CONDITIONS OF CONTROL OBJECT OPERATION

The analytic techniques of analyzing time responses of realtime system model operation introduced on structure modeling language in the form of dataflow graph have been proposed. The possibilities of stand-alone performance of processes and applied functions of the system for the time which does not contradict the desired dynamics conditions of control object functioning were studied. The applied functions and appropriate processes cooperation was analyzed in conditions of parallelization of the model and pipeline scheme of applying processor. The results of the analysis allow the project designer to estimate the ability of the designed system to perform the applied functions in time.

UDC 004.031.6

Scherbakov K.S., Scherbakov S.A., Kochegurov V.A.
THE DEVELOPMENT OF THE EMBEDDED SOFTWARE FOR THE PROGRAMMED LOGICAL CONTROLLERS USED IN INDUSTRIAL AUTOMATION DOMAIN

The method of development of the embedded software for the programmed logical controllers has been introduced. The method is based on transformation of code critical regions into critical sections at entire performance of process code.

UDC 004.415

Solomatov D.V.
SOFTWARE TOOLS OF EARTH SURFACE TEMPERATURE SOUNDING BY RTM-METHOD

The issues of implementation of bundled software for earth surface temperature sounding by RTM-method have been considered. The approach is based on using the radiation transfer model for atmospheric correction of satellite IR-measurements. A general structure of the bundled software was developed, the existing software tools were analyzed. The software tools for obtaining a priori information by satellite data were implemented and their validation was carried out. Implementation of the bundled software for on-line restore of the earth surface temperature was introduced.

UDC 681.3:002

Khaho I.Kh.
PROBABILISTIC MODELS AND METHODS IN PROBLEMS OF ANALYZING ELECTRIC EQUIPMENT SEISMIC STABILITY

The technique of forming seismic signal subject to duration and spectral density of seismic load has been considered. Function and density of propagating the probability of stationary random process ejection were obtained. The probabilistic estimates of absolute maximum and range were computed.

UDC 550.053:51-7

Kochegurov A.I.
DEFINING TIME POSITION OF SEISMIC SIGNALS BY FUNCTIONS OF THEIR GROUP DELAY

On the basis of analyzing the statistics of group delay functions the algorithms of defining time position of seismic signals have been constructed. Dispersions of estimating time position of strong signal for correlated and uncorrelated samples of group delay function of noisy signal mixture were obtained. It was shown that correlation occurrence does not change the algorithm structure but changes only weight coefficient values.

UDC 550.053.510.2+550.053.681.3(571.16)

Ivanchenkov V.P., Kochegurov A.I., Orlov O.V.
ON ACCURACY OF DEFINING TIME POSITION OF SEISMIC SIGNALS BY ESTIMATIONS OF THEIR PHASE-FREQUENCY CHARACTERISTIC

The results of studying the accuracy of defining time position of seismic signals by phase-frequency methods have been considered. The ana-

lytic forms for dispersion of estimating time position of seismic signals for the case of correlated and uncorrelated values of phase-frequency characteristics of seismic trace sections were introduced. The situation when the form of recorded signals is unknown, is separately analyzed.

UDC 550.8.053:519.2

Stepanov D.Yu., Rechkin M.S.
VELOCITY PROFILE CORRECTION BY THE DATA OF BROADSIDE VERTICAL SEISMIC PROFILING

Algorithm of velocity profile correction by the data of broadside vertical seismic profiling has been proposed. The models of errors in defining static corrections were considered; it was shown that this algorithm allows minimizing the influence of error in defining static corrections and so increasing the accuracy of estimating interval velocities.

UDC 622.276.05-192:519.6

Syzrantseva K.V., Arishin V.A.
THE ANALYSIS OF STRESS–STRAIN STATE OF POWER SECTION IN A SCREW DOWNHOLE MOTOR IN ANSYS BUNDLED SOFTWARE

A strength finite element analysis of a power section in a screw downhole motor has been carried out in ANSYS bundled software**.** All stages of analysis are described in details. The results of estimating rotor and stator stress-strain state as well as the pattern of contact pressure distribution between them which is required for motor operability estimation are introduced. The change of contact pressure distributions for motors with worn out stator resulting in violation of working chamber tightness condition is shown.

UDC 519.688:53.083.98

Volkov Yu.V., Tartakovskiy V.A.
ALGORITHM OF CHRONOLOGICAL SERIES SYNCHRONIZATION

Algorithm of restoring signal time periodicity has been considered by the example of dating the isotope chronologies of ice cores by known wood-ring isotope chronologies.

UDC 004.02.21

Sonkin D.M.
ADAPTIVE ALGORITHM OF DISTRIBUTING ORDERS FOR TAXI SERVICE

On the basis of known algorithms of determining maximum matching the adaptive algorithm of distributing orders for taxi service has been developed. The proposed methods of adapting the Kun algorithm and Hungarian method allowed reducing computational complexity of software implementation.

UDC 66.012-52

Kozin K.A., Goryunov A.G., Liventsov S.N., Gavrilov P.M., Revenko Yu.A.
ALGORITHM OF CONTROLLING SIEMENS–REACTOR MANUFACTURING POLYCRYSTALLINE SILICON

The cascade double-loop system of automated controlling the Siemens-reactor of manufacturing polycrystalline silicon by hydrogen reduction of trichlorosilane has been proposed; a controller type has been selected and its parameters have been calculated. The control algorithm providing optimal path of processing was proposed, implemented and studied. The possibility of applying the developed control algorithm for automation of devices of the Siemens-reactor type was proved.

UDC 61.01.29

Frantsina E.V., Dolganov I.M., Afanasieva Yu.I., Ivanchina E.D., Kravtsov A.V.
DEVELOPING ALGORITHM FOR CONTROLLING ESTIMATING KINETIC PARAMETERS OF DEHYDROGENATION PROCESS OF PARAFFINES C_9–C_{14} AND ITS SOFTWARE IMPLEMENTATION

Algorithm for identifying kinetic parameters of dehydrogenation process of hydrocarbons C_9-C_{14} has been developed and implemented in Delphi 7.0 environment. Pre-exponential factors and activation energies of all reactions occurring at dehydrogenation were estimated. The proposed algorithm may be used for solving the inverse kinetic problem when modeling the process of petroleum refining and petroleum chemistry processes.

UDC 519.816

Toldykina E.V., Kudinov A.V.
THE DEVELOPMENT OF ARCHITECTURE AND SOFTWARE TOOLS OF DATA MART FOR OIL AND GAS ENTERPRISES

Problems of developing branch information-analysis systems based on up-to-data OLAP-techniques have been analyzed. A variant of data warehouse architecture for a large oil and gas production enterprise was examined by the example of designing a subject data mart including analysis of specific data domain, designing multivariate data structures, analytic problem statement and their solution.

UDC 66.012

Beigel A.G., Goryunov A.G., Liventsov S.N., Panov K.B.
THE EXTREME CONTROL SYSTEM OF ELECTROLYZER FOR PRODUCING TRIFLATES

Questions of controlling the process of trifluorometansulfonic fluoride synthesis by electrochemical fluorination of metansulfonic fluoride have been considered. Since the dependence of electrolyte conductivity on metansulfonic fluoride concentration has a nonlinear character and application of typical linear control laws is not admissible, it was ascertained that the automatic control system designed on the basis of the extreme controller of electrolyte conductivity should be used for controlling the process of trifluorometansulfonic fluoride synthesis.

UDC 66.011:371.694

Nagaitsev O.V., Liventsova N.V., Liventsov S.N.
CONCEPT OF TRAINING MODEL OF ELECTROCHEMICAL PRODUCTION

A concept of computer simulator of electrochemical production ACS operator has been proposed by the example of fluorine production. Modular construction of simulation production model forming the basis of its simulator was developed and described.

UDC 004.023

Suchkov A.V., Lisienko V.G.
IMPLEMENTATION OF DECISION SUPPORT SYSTEM IN BLAST–FURNACE PROCESS

The approaches to constructing the decision support system for blast-furnace process have been analyzed. Algorithm of searching for control action was proposed for achieving the required output parameters by a furnace balance model. The sets of input and output parameters of the decision support system, the method of obtaining the results (references) and reduction of their set to the user friendly form were proposed.

UDC 004.942:616.12-07

Fedotov N.M., Zhary S.V., Shelupanov A.A., Petsh A.I., Koblosh A.S.
SIMULATION MODELING AND VISUALIZATION OF MYOCARDIUM ELECTRIC ACTIVITY

Programs of topical diagnostics for selective ablation of arrhythmogenic areas have been developed. Diagnostics is carried out by analyzing the simulation modeling results which represent the visible processes of myocardium electric activity on synthesized models of three-dimensional surfaces of chambers of heart internal structure. Modeling is implemented by the data of a limited set of the experimental points computed by the electrode location system. The results are introduced in time domain: dynamic and static maps of myocardium activation sequence located on the myocardium model surface with a control of myocardium activity level by the amplitude of the re-

corded signals. And in frequency domain: cartogram of dominant frequency distribution. Program applicability in clinical practice was tested.

UDC 004.932.2

Sidorov D.V., Osokin A.N., Markov N.G.
IMAGE QUALITY ESTIMATION USING WAVELETS

The full-reference quality metric of CW-SSIM images has been studied on the basis of complex wavelet. The full-reference metrics of AWS and fAWS being the modified versions of CW-SSIM metric and giving more adequate estimation to image quality were proposed.

UDC 620.179.15;621.396.965.8

Baranov V.A., Brazovskiy V.V., Kuleshov V.K., Evert U.
STATISTICAL GROUP–THEORETICAL METHODS OF IMAGE PROCESSING

Wide range of new image processing methods based on statistical estimation of group invariants of image automorphism has been considered. Group-theoretical statistical approach to solution of image reconstruction inverse problems allowing visualizing structural-functional relationships in control object was developed. The proposed methods are applied for solving the problems of noisy images restoration in nondestructive test.

UDC 519.2:519.688

Avramchuk V.S., Chan V.T.
TIME–AND–FREQUENCY CORRELATION ANALYSIS OF DIGITAL SIGNALS

The method of computing time-and-frequency correlation function allowing determining the interaction of signals on different frequencies has been proposed and analyzed.

UDC 004.02.21

Shkerdin A.N., Yudin O.F.
BIT STAFFING ERROR CORRECTION IN COMMUNICATION SYSTEMS WITH NEGATIVE ACKNOWLEDGEMENT

Analytic model of a channel and error statistics at data transfer have been considered; estimation of validity efficiency of increasing method of the information which is collected on the basis of calculating the error rate probability in a standard package HDLC is introduced.

UDC 004.056:336.717

Mescheriakov R.V.
STRUCTURE OF SPEECH SYNTHESIS AND RECOGNITION SYSTEMS

In the article the general approaches to systems of speech synthesis and recognition have been considered. Schemes how these systems process in them as two isolated systems which solve a direct or return problem are offered. Integration of two subsystems of speech synthesis and recognition into a uniform interactive system of a new quality is showed.

UDC 004.89:004.4

Tuzovskiy A.F., Cherniy A.V.
INFORMATION AND KNOWLEDGE INTEGRATION SYSTEM BASED ON SEMANTIC TECHNOLOGIES

The article is devoted to application of Semantic Web methodology in organizations for solving problems of integrating the heterogeneous information resources and data. The approach to such system development was described; architecture, the applied techniques and software products were proposed. The system is based on a set of ontologies and aimed at extraction, integration, categorization, search for heterogeneous knowledge objects of organization on the basis of information systems and documents available in the organization. The system allows integrating knowledge of several organization-partners. Methodology and system represent a universal platform to develop Knowledge management system that may be applied in any knowledge domain.

UDC 004.4'413

Kim K.Kh., Savinov A.P.
SYNTAX ANALYZER FOR QUESTION–ANSWER SYSTEM

Software implementation of text syntax analyzer algorithm in the natural Russian language in Borland Delphi 7 environment has been considered. Linguistic methodology of carrying out the deep syntax analysis of I.A. Melchuk is taken as a principle. The analysis of advantages and disadvantages of this approach from the point of view of programming is introduced. It is shown that introduction of a program block of the deep syntax analysis expands the possibilities of the question-answer system.

UDC 681.3.068+681.5

Berestneva O.G., Pekker Ya.S.
DETECTING HIDDEN PATTERNS IN COMPLEX SYSTEMS

The principle approaches to solving the problem of detecting hidden patterns in complex medical-biological systems have been considered. Peculiarities of how this problem can be solved in the case of quantitative and qualitative experimental data are shown. The technique of detecting hidden patterns on the basis of Data Mining methods is introduced.

UDC 004.89

Stoyanov A.K.
APPLICATION OF RECURRENT NEURAL NETWORK FOR CLUSTERING PROBLEM SOLUTION

Recurrent neural network with local feedback has been considered. It is shown that neurons in such network decrease distribution entropy of input signal. This property is the basis for developing the network solving the problem of clustering. The results of the experimental test of such network operation are introduced.

UDC 004.8.032.26

Vichugov V.N.
MODIFIED GRADIENT LEARNING ALGORITHM OF RADIAL–BASIS NEURAL NETWORKS

Radial-basis neural networks and multilayer perceptrons have been compared in tasks of identifying control object. Imperfections of classical gradient learning algorithm of neural networks are determined. Modified gradient learning algorithm allowing removing imperfections of classical one is proposed. The example of applying the modified algorithm in the task of two-dimensional function approximation is shown.

UDC 004.312

Matrosova A.Yu, Nikolaeva E.A.
SYNTHESIS OF FAULT DETECTION TESTS FOR PATH DELAY FAULTS OF CIRCUITS DESIGNED BY ROBDD SYSTEM

Combinational circuits designed by covering shared ROBDD with CLBs have been considered. It is found out that all path delay faults (PDFs) in these circuits manifest themselves as robust ones. Algorithm of designing a pair of test sets detecting PDF is proposed. Test patterns from pairs detecting PDFs are contained among tests for single stuck-at faults at the PLB poles of the circuit. Test for single PDFs is at the same time the test for multiple PDFs.

UDC 681.5

Ponomarev A.A.
MONITORING OF PROCESS OBJECT CURRENT HAZARD ON THE BASIS OF A COMPLEX FACTOR

The task of determining process object current hazard on the basis of the designed generalized hazard index has been considered. Properties possessed are selected, the formula for its computing and technique of accounting weight coefficient – rank are proposed.

UDC 004.9

Ponomarev A.A., Nguen Khoang Chin
SHARING BPEL LANGUAGE AND QUESTION-ANSWERING SYSTEM FOR DESCRIBING BUSINESS PROCESSES OF HEALTH SERVICE

A new approach to the task of increasing the efficiency of medical activity management due to designing, monitoring of business processes, as well as the questions of increasing information constituent of medical process at sharing Web-services and ontology server have been considered.

UDC 519.866

Pobedash P.N.
THE ANALYSIS OF THE MODEL OF EFFICIENT ECONOMIC GROWTH OF THE SYSTEM «MANUFACTURER – TAX CENTER» ON THE INFINITE INTERVAL ON THE BASIS OF THE PRINCIPLE OF SOLUTION NONTRIVIALITY

The Pareto-optimal value of criteria compression in the model of efficient economic growth of the system «manufacturer – tax centre» on the infinite time interval with two economic agents – manufacturer and tax center, has been found on the basis of principle of solution nontriviality. It allows estimating the efficiency of investment project described by the given model and developing the investment strategies taking into account interests of each participant.

UDC 519.865

Livshits K.I., Bublik Ya.S.
DISTRIBUTION DENSITY OF UNCOMMERCIAL FUND CAPITAL AT HYSTIRESIS CONTROL

The equations determining distribution density of uncommercial fund capital at hystiresis control have been obtained**.** The equation solution at exponential distribution of premiums came in fund and in the case of small premium load was found.

UDC 65.012.122

Samochernova L.I.
QUEUING SYSTEM OPTIMIZATION WITH VARIABLE RATE DEPENDING ON WAITING PERIOD

Single-line queuing system with variable service rate depending on waiting period being the first in the queue has been studied. The system was optimized considering losses for waiting and depreciation.

UDC 519.872;519.21

Nazarov A.A., Nosova M.G.
MULTIPHASE INDEPENDENT SYSTEM OF MASS SERVICE AND ITS APPLICATION TO DEMOGRAPHY PROBLEMS

Mathematical model of demographic situation changing in the form of independent system of mass service system with two types of demands and unlimited number of devices has been proposed. It is studied by the method of moments. The first and the second moments of the amount of demands served in the system have been found. The developed model and method are applied to predicting the process of changing demographic situation in the Russian Federation.

UDC 519.872

Nazarov A.A., Gorbatenko A.E.
ASYMPTOTIC ANALYSIS OF MMP|M|1|CRC SYSTEM IN CONDITION OF LIMIT RARE CHANGES OF ARRIVAL PROCESS STATES

The queuing system MMP|M|1|CRC has been considered as a mathematical model in the communication network. The method of asymptotic analysis in condition of limit rare changes of arrival process states was proposed for determining distribution of probabilities related to the demands in a recall source.

UDC 519.872

Nazarov A.A., Lapatin I.L.
ASYMPTOTIC ANALYSIS OF OUTPUT FLOW IN MAP|GI|∞ SYSTEM

Queuing system output flow with infinite number of devices and input MAP-flow has been studied. The model with arbitrary distribution of service time was examined. The shifted flow method for studying the output flows of non-Markovian queuing systems with infinite number of devices was proposed. It was shown that in condition of growing serving time the output flow is asymptotically simplest.

UDC 004.65

Osipova V.V., Chudinov I.L.
DEVELOPMENT OF THE MODEL FOR PRESENTING META-DATA OF DATABASE OF THE INTEGRATED UNIVERSITY INFORMATION ENVIRONMENT

The model of presenting the system description of the structure and semantic of database in the integrated university information environment by the example of TPU has been proposed. It is intended for functioning universal procedure-oriented tools which operate the database objects in

UDC 681.3.01

Berestneva O.G., Marukhina O.V., Shevelev G.E., Minenko L.I., Scherbakov D.O.
USING THE RESULTS OF EXPERT ESTIMATION FOR MEASURING COMPETENCE OF TECHNICAL UNIVERSITY STUDENTS AND GRADUATES

The possibilities of estimating and analyzing the competence components have been examined by the results of experimental investigation which were carried out at Tomsk polytechnic university. It was shown that it allowed singling out the important features in the structure of subject-activity competence of the technical university students. The algorithm for determining the generalized expert opinion subject to measuring scale type was developed. The results of applying the developed algorithm for solving two applied problems were introduced.