
Summaries

UDC 54.022;519.722;519.17

Dehmer M., Emmert-Shtreib F., Tsoy Yu.R., Varmuza K.
**NEW INFORMATION FUNCTIONAL FOR ANALYZING
CHEMICAL GRAPH STRUCTURES**

The information functional based on power-mode graph associations has been introduced. Such approach allows obtaining a parametric measure of graph entropy required for estimating the graph structure information. The example demonstrating the proposed measure computation was given.

UDC 681.5

Gaivoronskiy S.A., Sukhodoev M.S.
**DETERMINING THE ADJUSTMENTS OF LINEAR ROBUST
CONTROLLERS PROVIDING APERIODIC TRANSIENTS IN
INTERVAL SYSTEMS**

The adjustments of robust PI- and PID-controllers providing aperiodic character of transients in the systems at all possible values of interval-defined parameters of control object have been determined. The developed procedures of the controller parametric synthesis are based on assignment of the boundaries of dominant real root of the system characteristic polynomial, division of the controller parameters into dependent and free ones and application of D-partition technique for the systems in polyhedron vortices of polynomial interval coefficients.

UDC 681.5

Efimov S.V., Zamyatin S.V., Gaivoronskiy S.A.
**THE PROBLEMS OF ROOT ANALYSIS AND SYNTHESIS
OF AUTOMATIC CONTROL SYSTEM**

The problem of obtaining direct quality factors of the system on the basis of its root estimate has been studied. The criterion of ε -dominance of transient function components of automatic control system was considered. The examples illustrating the necessity of considering the position of all zeroes and poles of the system for exact estimation of its dynamic properties are given.

UDC 681.5

Alekseev A.S., Zamyatin S.V.
**PARAMETRIC AUTOTUNING OF CONTROLLERS
OF AUTOMATIC CONTROL MULTI-LOOP SYSTEMS**

The approach allowing synthesizing multi-loop systems of automatic control based on real valued Laplace transform has been considered. The bundled software of controller adjustment was implemented on the basis of this approach. The results of the bundled software operation are shown by the numerical example.

UDC 681.5

Zatonskiy A.V.
**BALANCING LATENT STOCHASTIC PROPERTIES
OF AUTOMATIC CONTROL OBJECT**

The possibility of balancing latent variable properties of the object applying special predictor representing a modification of Smith predictor for the object with the variable properties has been shown. The investigations of simulation model showed the possibility of improving considerably the quality of controlling by the proposed technique.

UDC 519.7;519.81

Kolesnikova S.I., Volchenko E.V.
**THE APPROACH TO SMOOTHING AND RECONSTRUCTING
THE FORM OF STOCHASTIC OBJECT STATES ON THE BASIS
OF MASTER PATTERN**

The approach to smoothing (filtration) and reconstructing trend of time series fragments as the model of stochastic dynamic system state has been considered. The approach is implemented as the algorithms of forming generalized masters of the states of multi-dimensional time series, time series smoothing on their basis, forming features of states as a form of functional dependence on the basis of overlapping methods of direct extrapolation, difference networks and generalized masters of series state. The numerical modeling data are introduced.

UDC 519.245+510.52

Reizlin V.I.
**THE EFFICIENT METHOD OF CONSTRUCTING PSEUDORAN-
DOM VECTORS EVENLY DISTRIBUTED IN HYPERCONE**

The algorithm of efficient obtaining the pseudorandom vectors evenly distributed in n-dimensional hypercone has been developed. Its highest efficiency in comparison with the expulsion method in the case of high n is shown. The results of the computer experiment confirming the theoretical constructions are introduced.

UDC 621.391

Bykov S.F., Blynskiy A.A.
**THE DEVELOPMENT OF GENERALIZED SCALE-TIME
SIGNAL PRESENTATION**

The obtaining of generalized scale-time signal presentation which is determined as a complex of scale-time (wavelet transform) and scale-inverse signal presentation has been considered. Application of the generalized scale-time signal presentation allows extending the possibilities of analyzing and processing signals of different nature.

UDC 004.94

Pogrebnoy V.K.
**DETERMINING AND ANALYZING THE REGION
OF REAL-TIME SYSTEM MODEL STATES**

The conditions of dynamic of the control object functioning have been selected and the technique of the real-time system model presentation by the complex of the dynamic objects (processes) has been proposed on the basis of this. The region of states in which the dynamic model of the real-time system may stay was determined. The possibility of evolution searching for the variant of the real-time system model with the advanced path characteristics was shown by the example of constructing the computed path of the model state change reflecting the dynamic of its functioning.

UDC 519.7;519.81

Kolesnikova S.I.
**THE METHODS OF RECOGNIZING
THE DYNAMIC SYSTEM STASES**

The approaches to recognizing the state of stochastic dynamic systems and the methods implementing them have been considered. The procedure of correct accounting the significance of dynamic sets

of information factors when solving the problem of recognition is introduced. The data of numerical simulation and method approval at the applied problem solution are given.

UDC 519.673:62-51.37

Khamukhin A.A.
**MESH MODEL OF THE DEVICE FOR SOLVING
THE PARTIAL DIFFERENTIAL EQUATIONS**

One of the possible implementations of the computational process at homogeneous structure meshes with variable increment has been introduced. The examined model is intended for iterative solution of finite-difference approximations of partial differential equations. It is shown that substitution of full-size variables by their increments at transmission between the meshes results in speedup of solution and hardware saving. It was proposed to use the model at developing special co-processors for increasing universal computer capacity when solving the problems of the given class.

UDC 519.673

Khamukhin A.A.
**RECONFIGURATION OF HOMOGENEOUS
COMPUTATIONAL STRUCTURE
WITH NONPROGRAMMABLE CELLS FOR SOLVING
PARTIAL DIFFERENTIAL EQUATIONS**

The possibilities of nonprogrammable cell of homogeneous structure for solving the partial differential equations, which allow implementing various solution regions without any hardware supplements to the cell scheme, that provides reconfiguration of homogeneous computation structure constructed of such cells within the frames of the given class of problems have been introduced.

UDC 004.032.6;004.357

Kulagin V.P., Matchin V.T.
**MATHEMATICAL SIMULATION
OF OLAP-CUBE IN THE FRAME OF AGGREGATION
OF SIMPLE AND HIERARCHICAL MEASUREMENTS**

The article is devoted to investigation of data aggregation in multidimensional OLAP-cube in simple and hierarchical cases of constructing measurements. The formulas for calculating the amount of aggregates and aggregate combinations in simple and hierarchical cases of measurement construction are obtained.

UDC 004.657

Mironov A.A., Sigov A.S.
**SEMANTIC-ENTROPY CONTROL
OF INFORMATION MORPHISM OF xOLAP
IMPLEMENTATIONS**

The analysis of the experience of developing and maintaining data banks indicates the fact that the difficulties generated by the absence of the established semantic theory of information processes and systems are more pronounced in this very region of IT industry. The article is aimed to the study of xOLAP models oriented to the semantic control methods, concerns the notions of semantic breaks in respect to xOLAP, their semantic-entropy estimates and control.

UDC 004.822

Voitovich A.Yu., Mordvinov V.A.
**QUESTIONS OF COMPUTER NETWORK
SOFTWARE ON THE BASIS
OF SEMANTIC APPROACH**

The update of approaches to simulation and formalization of information morphism description on interlevel transitions of semantic structure saving the guaranteed indices of pertinence, relevance and cognition of information systems constructed on the basis of fibered architectures has been considered.

UDC 535.31

Kozyreva A.V.
**ALGORITHMS FOR POSITIONING
THE MOBILE DEVICE ON THE BASIS
OF DATA RECEIVED FROM BUILT-UP CAMERA**

This paper analyzes the possibility of developing software product for positioning mobile device in the space relative to the other objects. Algorithms of camera calibration as well as the algorithms of finding image features and their further tracing were considered. The change of position in the space is determined by searching the unknown coefficients in the rotation matrix and shift vector on the basis of the obtained calibration data and determined features. Based on founded feature and calibration data rotation matrix and shift vector are calculated. On the basis of the results of different algorithms functioning the simplified technique for solving concrete problems was developed. The results of the work can be used for control mobile devices or in the games.

UDC 519.688

Kokh A.M.
**THE PARALLELING ALGORITHM OF PROCESSING
DIGITAL VIDEO STREAM**

A new algorithm of decoding digital video stream where computation paralleling is used together with synchronization of reconstructing bearing and predicted blocks of video information has been proposed. The algorithm is two times more productive of the existing analogues for video streams of standard resolution and three times for video streams of high definition.

UDC 65.012.122

Samochnova L.I.
**SERVING SYSTEM OPTIMIZATION WITH
A BACKUP DEVICE WITH CONTROL
DEPENDING ON LATENT PERIOD**

Information handling system has been studied. Its functioning is described by mathematical model of serving system with a backup device controlled by current time of waiting for order being in the first order. The system was optimized allowing for losses by waiting and depreciation.

UDC 004.312

Matrosova A.Yu., Melnikov A.V.
**TESTING PATH DELAY FAULT
IN CONDITIONS OF LIMITATIONS TO TEST
PATTERN PAIRS SELECTION**

Single path delay defaults of combinational circuits in conditions of limitations to the test pattern pair selection have been considered. Situations in which one and the same pair of test patterns may be used for detecting opposite edges of signal values of the examined path are determined. Accounting such situations allows decreasing the length of fault detection test for path delay fault of combinational circuit. The example of combinational circuit class in which there is a pair of test patterns satisfying limitations entered in operation for each path is given. The computer experiments fulfilled at test cases confirm high quality of testing path delay fault in circuits of such class.

UDC 618.5:519.68

Zhigulin M.V., Evtushenko N.V., Dmitriev I.M.
**TEST GENERATION WITH GUARANTEED CONFIDENCE
FOR TIME STATE MACHINES**

Algorithm of constructing the complete test suite for timed state machine relative to the model of «black box» has been proposed. It is supposed that only upper estimate of a number of states and the value of maximum finite delay in the state are known in the tested state machine. The complete test is structured by the machine-specification without search for the tested machines.

UDC 519.876.5

Tsapko G.P., Tsapko S.G., Tarakanov D.V.
ORGANIZATION AND MODE E OPERATION
OF MULTIFUNCTIONAL SIMULATION CIRCUITS

Mechanisms for implementation of multifunctional simulation circuits have been proposed. The implementation of simulation circuit with open structure is shown; time modes of operation of series multifunctional circuit are considered. The implementation of cyclic multifunctional simulation circuit and its implementation in terms of E-network are introduced. The implementation of the developed close multifunctional simulation circuit supporting multiple selective service of the group of heterogeneous functional processes with minimum amount of E-network models is introduced.

UDC 519.71

Yampolskiy V.Z., Zakharova A.A.
CRITERIA AND MEANS OF DEVELOPING PROGRAM
SOFTWARE FOR MODELING OIL-GAS FIELDS

The results of analysis of applicability and efficiency of software systems of the chief foreign and domestic producers cultivated on the the information technology market for modeling oil and gas fields have been discussed. The criteria of estimating basic software systems which should be obeyed at selection justification are stated. Formal description of complex processes of geological and hydrogeology simulation of oil and gas fields using digital 3D-models and software systems supporting them is given.

UDC 519.71

Zakharova A.A., Yampolskiy V.Z.
ALGORITHMIC AND PROGRAM SOFTWARE
FOR PRE- AND POST PROCESSING AT 3D-MODELING
OF OIL AND GAS FIELDS

The problems of developing information technologies of 3D-modeling of oil and gas fields on the basis of appending the core software with algorithms and concurrent software modulus for pre- and post processing have been discussed. The possibility of solving with their help the number of urgent problems of geology-hydrogeology simulation: generation of thematic maps, surface maps of partial and pair correlations, determination of the development cross-sectional areas applying the methods of reservoir recovery intensification and without them as well as visualization of problem solution results, is shown.

UDC 519.816

Zagorulko Yu.A., Anureev I.A., Zagorulko G.B.
THE APPROACH TO THE DEVELOPMENT
OF DECISION SUPPORT SYSTEM BY THE EXAMPLE
OF OIL AND GAS PRODUCTION ENTERPRISE

The approach to the development of the system providing the decision support of the problems of routine management behavior for people making decision for decreasing energy consumption of hydrocarbon production process at oil and gas production enterprise and increasing ecological safety of this process has been considered. The architecture and principles of constructing such system is discussed.

UDC 681.518.3

Shumikhin A.G., Vyalykh I.A.
FORMING THE MEMBERSHIP FUNCTIONS FOR ALGORITHM
OF FUZZY CONTROLLING THE CATALYTIC CRACKING
TECHNOLOGICAL PROCESS

The application of algorithm of automatic variable classification of technological process in the whole spectrum of their actual values by the dynamic concentration method has been studied. The results of fuzzy classification of measurement information on values of technological parameters at the number of classes given a priori, singling out the coordinates of class centers and automatic construction of membership function of these variables precise values to the proper classes are introduced by the example of technological process of catalytic cracking indicating the appropriateness of applying the examined method.

UDC 681.5

Burmantov D.G., Efimov S.V., Kononov V.I.,
Kochegurova E.A., Kurganov V.V.
THE AUTOMATIC CONTROL SYSTEM OF NITROGEN
PRESSURE IN THE CAPACITANCE FOR STORING CATALYST
COMPLEX WITH TWO CONTROL ACTIONS

The variant of the system of nitrogen pressure automatic control in the capacitance for storing catalyst complex has been proposed. The feature of the system is the use of one controller with two control actions and application of hysteresis at control signal formation.

UDC 004.422.8:539.2

Petelin A.E., Kolupaeva S.N.
AUTOMATION OF STUDYING CRYSTALLOGRAPHIC SLIP
IN B FCC METALS

The architecture, possibilities and features of implementing the software Dislocation Dynamics of Crystallographic Slip (DDCS), intended for automation of studying dislocation dynamics of crystallographic slip in FCC metals have been introduced. The software DDCS allows computing energy, scale and time characteristics of elementary crystallographic slip and slip zone as a whole.

UDC 681.52

Philippov M.M., Babushkin Yu.V., Gribenyukov A.I., Ginsar V.E.
THE CONTROL SYSTEM OF MULTIZONE THERMAL INSTAL-
LATION FOR GROWING CRYSTALS BY BRIDGMAN METHOD

The description of automatic control system of multizone thermal installation for growing crystals by Bridgman method in vertical variant has been introduced. The results of introducing and approving the proposed system are shown.

UDC 681.511.4

Skorospeshkin M.V., Tsapko G.P., Skorospeshkin V.N.
THE ADAPTIVE SYSTEM OF CONTROLLING TEMPERATURE
OF SHELL-AND-TUBE HEAT EXCHANGER

The adaptive system of controlling temperature of hydrocarbon condensate at the output of shell-and-tube heat exchanger, including PI-controller and series pseudo-linear correcting device of dynamic properties of the automatic control system has been proposed. The properties of temperature control adaptive system were studied. The efficiency of the proposed adaptive system at changing parameters of the control object in the course of time was shown.

UDC 669.162.28

Spirin N.A., Lavrov V.V., Burykin A.A.,
Krasnobaev A.V., Bykov A.G.
ENGINEERING AND MEANS OF DEVELOPING
INFORMATION-MODELING SYSTEMS FOR SOLVING
TECHNOLOGICAL PROBLEMS IN METALLURGY

The technological features and means of developing software used by the authors at creating modern information-modeling systems for solving technological problems in the field of blast-furnace production, in particular solving the problem of optimal distribution of fuel-energy resources in the group of blast furnaces have been reflected.

UDC 004.021

Schelkanov S.V., Tereschenko A.G.,
Grigoriev V.P., Vylegzhanin O.N.
THE DEVELOPMENT OF ALGORITHM CONSTRUCTOR
AND INTERPRETER OF INTERNAL LABORATORY
VERIFICATION OF THE ANALYSIS RESULTS QUALITY

The implementation of algorithm constructor and interpreter of internal laboratory verification in the structure of LIMS «Khimik-analitik» on the basis of the proposed conceptual model of computing sequence decomposition into any quantity of components is shown.

UDC 658.512.22:004.514

Petunin A.A.
**AUTOMATIC SELECTION OF COMPUTING TECHNIQUE
OF NESTING PROBLEM USING THE COMPARATIVE
ANALYSIS OF ALGORITHMS**

The material nesting problems have been considered. Problem classification for studying the efficiency of the existing cutting algorithms for the problems of certain class was proposed. Three optimization algorithms of nesting problem were tested. On the basis of the obtained results the scheme of automatic selection of the optimization algorithm depending on the proposed task typology was determined.

UDC 004.9

Sharopin K.A., Berestneva O.G., Shkatova G.I.
**VISUALIZATION OF THE EXPERIMENTAL
INVESTIGATION RESULTS**

The interactive means of graphic representation modification are the powerful means of analyzing information. Different approaches to visualizing the results of the experimental social and medico-psychological studies are introduced in the paper. The examples of solving the applied problems are given.

UDC 004.91;004.04

Fam Van Tap, Ponomarev A.A.
**ORGANIZATION OF MEDICAL INFORMATION SYSTEM
USING ELECTRONIC CLINICAL DOCUMENTS IN STANDARD
HL7 CDA AT SUPPORT OF OFFICE OPEN XML FORMATS**

The problem of automation of document circulation control process in the field of health service has been solved. The efficient technique of entering or refreshing information on a patient in a central system using the pattern, having the Office Open XML formats, was proposed. Application of medical standard HL7 CDA for the problems of developing clinical documents and means of electronic digital signature, applicable for being used in integrated information space, was described. Practical guidelines on using languages C# and ASP.NET for solving the given problems are introduced as well.