Summaries

UDC 519.2

Kitaeva A.V.
RECURRENT ESTIMATIONN OF THE INTENSITY FUNCTION OF POISSON PROCESS

Recurrent estimations of the Poisson process intensity constructed under a single implementation and similar to recurrent nuclear estimations of density are examined. The asymptotic unbiasedness and convergence in the mean-square of the offered estimation are shown. Asymptotic results are obtained in the interval of the fixed length in the scheme of series when the intensity of the process increases beyond all bounds.

UDC 535.3+519.61

Reyzlin V.I., Marchuk S.M., Dyomin A.Yu.
APPROXIMATION OF THE NON-SPHERICAL SURFACE PROFILE

The method to approximate the non-spherical optical surface profile which has manufacturing defects is described. To approximate, measured deviations of the real non-spherical surface profile from designed ones are used. Approximation results are new values of coefficients in the formula which specifies non-spherical surface profile. Approximation is carried out to analyze the effect of manufacturing defects on image quality of the optical system which includes the real non-spherical surface. The offered method is implemented in PROFILE application.

UDC 519.254, 533.6.011.72

Daneykin Yu.V., Danileyko R.V., Yushitsin K.V.
MEASUREMENT OF DISTURBANCE VELOCITY IN THE SHOCK WAVE FRONT IN THE NUMERICAL EXPERIMENT

Dynamics of the shock wave modeling front is investigated to develop the technique of its parameters determination within the limits of the numerical experiment. In particular, it is established that the speed of disturbance velocity in the numerical front displays the properties of a random variable. The analysis of a statistical multitude distribution function obtained at numerical differentiation of characteristics is carried out. A satisfactory consent with the normal law is obtained. The influence of pseudo-viscosity of a difference scheme on change of disturbance velocity along the height of the numeric shock front is defined.

UDC 550.8.053:519.2

Stepanov D.Yu., Yapparova E.A.
FAN FILTERING RESOLUTION AND PARAMETERS AT DEVELOPMENT OF SEISMIC WAVE FIELDS

Estimation techniques of a fan filter resolution, which consider the presence of disturbing waves and are based on two approaches: achievement of the demanded signal to noise ratio and provision of the demanded maximal distortion of the signal spectrum. Optimum and empirical estimations of the fan filter parameters are obtained at seismic information development.

UDC 550.053:510.2+550.053:681.3(571.16)

Ivanchenkov V.P., Kolesnikova E.G., Kozlov A.A.
ADAPTIVE PHASE-FREQUENCY ESTIMATION ALGORITHMS OF SEISMIC SIGNALS TIME POSITION

Questions regarding estimation of seismic signals time position, registered in various reception points, in conditions of essential aprioristic uncertainty are examined. The problems of adaptive phase-frequency algorithm synthesis are solved; the research results of their efficiency are cited. A high noise stability and resolution of the offered methods and an opportunity of their application in complex seismogeological conditions when there is no full aprioristic information on properties of allocated signals and noises are shown.

UDC 378 (075.8)

Koshekov K.T.
TECHNOLOGIES OF VECTOR IDENTIFICATION SCALES IN METHODOLOGY OF SIGNAL RECOGNITION AND CLASSIFICATION

Applications of vector identification scales for to solve the problem of signal recognition are examined. The examples illustrating the superiority of scales, their mathematical models and ways of organization are described. Analytical forms of the equations by identification parameters of the signals, measured by testers of distributions of instant values and time intervals, are presented.

UDC 004.89

Novoseltsev V.B., Pinzhin A.E.
IMPLEMENTATON OF THE EFFECTIVE ALGORITHM OF LINEAR FUNCTIONAL PROGRAM SYNTHESIS

The algorithm of linear program synthesis on the basis of the selected specification is offered. The algorithm allows achieving high efficiency due to preliminary preparation of special data structures. Expenditures for output and extraction of the program are characterized by linear function from quantity of attributes and functional relations declared in the specification. The results of experiment comparison with existing algorithms are cited.

UDC 681.332

Shalaev Yu.N.
MODELING OF THE BOUNDARY PROBLEM OF NON-STATIONARY DYNAMIC SYSTEMS

The differential equation of a dynamic system on the basis of the state space method is written in the normal form in the form of the system of differential equations of the first order. Under the method of representing vectors, the obtained system of equations is written in the vector-matrix form. Further transformations, necessary for estimation of the system output signal under selected boundary conditions, are carried out by numerical methods. It allows to use computers successfully, and to write down the final result in the analog form on the basis of the reference formula.

UDC 004.89

Kovalenko D.A.
METHODS AND MEANS OF AUTOMATIC SYNTHESIS OF PARALLEL PROGRAMS ON THE BASIS OF THE THEORY OF STRUCTURAL FUNCTIONAL MODELS

Methods and algorithms of automatic synthesis of a parallel program under the selected non-procedural specifications are examined. Approaches to synthesis of parallel programs with application of the multilevel structure of the algorithm graph are investigated. Computing complexity of the offered algorithms is cited. Questions of practical implementation of the developed approaches are examined.

UDC 519.67 (004.02)

Sergeev V.V., Korostelev S.J., Psakhe S.G.
ALGORITHMS OF POINT LOCALIZATION IN THREE-DIMENSIONAL SPACE FOR OBJECT GENERATION AT MODELING BY THE PARTICLE METHOD

Two algorithms are offered to solve the problem of construction of complex configuration three-dimensional objects and design area filling with modeled particles. Substantive provisions, advantages and disadvantages of each of the algorithm are presented. The methods to increase efficiency of the given problem solution by means of modern computer technologies are offered on the basis of test calculations.

UDC 681.51.013

Vadutov O.S.
SYNTHESIS OF DISCRETE SYSTEMS WITH PID-REGULATOR

The synthesis algorithm of discrete systems with PID-regulator based on a combination of modal and frequency methods is offered. At the first stage, the space of one of three parameters of the regulator, for all points of which a desirable accommodation of the system poles is guaranteed, is determined by means of the modified version of D-decomposition. At the second stage, the search of values of the regulator parameters, providing a minimum of square-law criterion of approach processes in reference and synthesized systems, is realized. Examples are cited.

UDC 681.511.4

Skorospeshkin M.V.
THE ADAPTIVE TWO-CHANNEL CORRECTING DEVICE FOR AUTOMATIC CONTROL SYSTEMS

The adaptive pseudo-linear two-channel correcting device of dynamic properties of automatic control systems is offered. The research of properties of automatic control systems with the adaptive pseudo-linear two-channel correcting device is carried out. Efficiency of the offered corrector in automatic control systems with non-stationary parameters is shown.

UDC 681.5

Efimov S.V., Zamyatin S.V., Sukhodoev M.S., Gayvoronskiy S.A.
DETERMINATION OF THE DESIRABLE ARRANGEMENT AREA OF DOMINATING POLES OF THE CLOSED SYSTEM IN VIEW OF ITS ZEROES

The analysis of influence of an arrangement of zeros and poles of the automatic control closed system on quality of its transients is carried out. The opportunity of provision in automatic control systems of selected direct parameters of quality under condition of account of zeroes of the closed system transfer function is shown. The technique to find boundary border of the arrangement area of dominating poles of the system with selected parameters of quality is developed. The numerical example is examined.

UDC 681.5

Sukhodoev M.S., Gayvoronskiy S.A., Zamyatin S.V.
ANALYSIS AND SYNTHESIS OF AUTOMATIC CONTROL ROBUST SYSTEMS IN THE MATLAB ENVIRONMENT

The complex of programs for analysis and synthesis of automatic control systems with guaranteed root parameters of quality is developed. Algorithms are based on robust expansion of the root hodograph method with application of Theodorchic-Evans's equations. Numerical examples are cited.

UDC 681.3

Zamyatin S.V., Plotnikov D.A., Goncharov V.I.
IDENTIFICATION OF NONLINEAR OBJECTS ON THE BASIS OF THE MATERIAL INTERPOLATION METHOD

Application of the material interpolation method to obtain the analytical description of static characteristics of nonlinear parts is examined. The transformation, which allows to translate basic computing procedures into the image area where the complexity of operations decreases, is attractes with this purpose. As a result of the given transformation the analytical description of static characteristics is represented in the form of the truncated row. The operating capacity of the offered approach proves to be true by numerical examples.

UDC 681.3.06

Malchukov A.N., Osokin A.N.
THE SYSTEM OF AUTOMATED CODEC DESIGNING OF SHORT LENGTH ERROR-CONTROL CODES

The system of automated designing of high-speed codecs of effective error-control codes is examined. The system allows to project codecs of linear short length block codes with the minimal redundancy on the selected by the user parameters: length of the information block and desirable quantity of corrected independent errors.

UDC 519.853

Vylegzhanin O.N., Shkatova G.I.
ACCOUNT OF EQUALITY RESTRICTIONS AT SOLVING OF OPTIMISATION PROBLEMS WITH LINEAR RESTRICTIONS

The algorithm allowing reducing space dimension of the required vector of unknown at solution of optimization problems with restrictions-equalities is offered. The algorithm is based on the modified procedure of recurrent pseudo-reference. Expressions for transformation of the objective function in cases when it is the linear or the square-law form are obtained. The numerical example of the algorithm application for the problem of linear programming is cited.

UDC 681.3.06

Pogrebnoy V.K.
ON CONSTRUCTION OF ACTIVE MODELS OF REAL TIME DISTRIBUTED SYSTEMS

The approach to solve problems of decrease in labor input to construct an imitating model and its transformation is offered. Concepts of the system active model, virtual modeling machine, module-simulator and descriptors of conditions of its input and output positions are introduced. The definition offered and the original structure of the module-simulator including the adaptation block, operational block and the block of position condition descriptors is defined. A list of adjustments and functions implemented functions at designing of the adaptation block is developed. The definition of the module position descriptor conditions is given, as potential data carriers on feature space where the active model functions at its performance on the virtual machine. The functional structure of the active model is offered and stages of its construction are formulated.

UDC 681.3.06

Ogorodov S.V.
SUBSTANTIATION OF LINEARLY-ORDERED REPRESENTATION OF GRAPH PROGRAM MODELS

The linearly-ordered representation of graph program models is offered in the form of an array of branches and branches-connections, in the basis of which a new double-position FK-numeration of peaks of oriented graphs is assumed. The given representation of graph models of programs allows to completely reveal all structural characteristics of operating graphs of programs and on their basis to realize effective optimization algorithms of an objective program codes at their translation from programming languages of a high level.

UDC 681.142.2

Titkov A.V., Kruchinin V.V.
THE LANGUAGE OF COMBINATORY ARRAY GENERATORS DESCRIPTION

A universal tool for construction and research of combinatory multitude generators based on the functional language which allows describing schemes of recursive compositions of trees AND/OR is offered. The variant of such tool implementation is offered as an expansion of the system library STL for the programming language C++.

UDC 004.89

Novoseltsev V.B.
EFFECTIVE NON-RESOLUTIVE OUTPUT FOR A LIMITED CALCULATION OF HORN DISJUNCTS

The mechanism providing a logic conclusion for systems of logic programming of the Prologue type is presented. The offered approach differs from the standard method of resolutions and leans on return strategy in S.Yu. Maslov's style. Due to introduction of strictly outlined restrictions on semantics of the input language it is possible to reach completeness and an effective (polynomial) resolvability of the applied formal theory.

UDC 004.89

Aksyonov S.V.
ALLOCATION MECHANISMS OF CONTRAST STAGE FRAGMENTS BY THE SYSTEM OF ASCENDING ATTENTION

The system of ascending attention analyzes fragments of visual stages allocating the most contrast and informative areas. The

approach expanding L. Itti's model of ascending attention with the purpose to more effectively account the distance between color components and decrease of influence to transformations and width of local characteristics of the stage is offered in work.

UDC 681.3.06

Botygin I.A., Kalikin K.A.
RESEARCH OF SCHEMES OF THE DISTRIBUTED INFORMATION INTERACTION OF PROGRAM COMPLEXE COMPONENTS WITH DATABASES

The main construction schemes of the remote information interaction with databases are examined. Imitating program experiments directed on the quantitative estimation of sample time, change, removal of one or several records, and time of data transmission between applications and the server are carried. Control systems of databases Paradox, MS Access, Borland Interbase, MySQL, MS SQL, and Oracle have been investigated. The scheme of «batch data transmission», providing the maximal productivity and higher loading ability in comparison with other investigated interaction schemes of user applications and SUBD is developed.

UDC 681.3.06

Botygin I.A., Kalikin K.A.
RESEARCH OF METHODS TO INCREASE PRODUCTIVITY OF WEB-APPLICATIONS

The main methods to increase productivity of server applications are examined. Imitating program experiments directed on estimation of quantity of inquiries processed by the server, traffic volumes created by applications, demanded volume of operative memory, and average response time are carried out. It is shown that the most preferable variant, from the point of view of practical application, is the variant with cashing of dynamic pages on the side of the client, activation of PHP in the mode FastCGI and processing of static files by the FrontEnd-server Nginx.

UDC 002.53:004.89

Zagorulko Yu.A.
AUTOMATION OF ONTOLOGIC INFORMATION GATHERING ABOUT INTERNET-RESOURCES FOR THE SCIENTIFIC KNOWLEDGE PORTAL

The approach to automation of ontologic information gathering about Internet-resources relevant to the subject field of the scientific knowledge portal is offered. A special subsystem carries out the search of resources (documents), estimation of their relevance, substantial analysis, indexing and classification with application of a subject dictionary and ontology of the subject field.

UDC 688.518:622.276

Zakharova A.A., Ivanov M.A.
OPTIMIZATION OF A 3D-MODELING DIGITAL PROCESS OF OIL AND GAS FIELDS

The optimization scheme of a 3D-modeling digital process of oil and gas fields is offered. It allows reducing the terms to design the development of oil-and-gas deposits, to raise quality and reliability of created models. The developed software automate various stages of the modeling process and are applied at to solve practical problems. The given means were tested at designing development of several deposits of Tomsk region, as well as by preparation of experts in the field of designing development of oil-and-gas deposits.

UDC 66.011

Yuryev E.M., Ivashkina E.N., Ivanchina E.D., Kravtsov A.V.
SYSTEMS OF TECHNOLOGICAL MODELING FOR MONITORING AND OPTIMIZATION OF OIL REFINING PRODUCTION

Computer modeling systems of oil refining and petrochemistry processes are developed with application of the system approach strategy. A non-stationary mathematical model of the catalytic process, constructed in view of reaction ability of hydrocarbons and possessing in this connection the predicting ability, is in the basis of each of the system.

A production-frame model of processes of linear alkylbenzene synthesis is developed to define the reasons of emergency occurrence in the devices that are a part of the technological scheme of the installation. The model describes to the user the actions of personnel on elimination of the emergency. Adaptation of software products on a real industrial facility is carried out by means of development of the communication module with a uniform thematic display of factory data.

UDC 66.012-52

Vilnina A.V., Liventsov S.N.
THE ADAPTIVE ALGORITHM OF CONTROL OVER THE UNIT OF DESUBLIMATION OF URANIUM HEXAFLUORIDE

The adaptive algorithm of desublimation unit control is developed on the basis of the mathematical model. The algorithm of control is reduced to define the beginning of the steam mode activation time for a corresponding section. The adaptation consists in definition of the current value of desublimation degree under indications of tensovesses, which allows raising the efficiency of a cylinder filling by a finished product (uranium hexafluoride).

UDC 681.58:004.353

Mezentsev A.A., Pavlov V.M., Baystrukov K.I., Sharnin A.V.
TOKAMAK KTM EXPERIMENTAL DATA VISUALISATION SYSTEM DESIGNING

The question of experimental data visualization system designing for the KTM installation on the controlled thermonuclear synthesis, which is developed to carry out researches on influence of high-temperature plasma on various materials located in the diverter area, is examined. Technical solutions of visualization system and principles of video system construction with a multiple access are analyzed on control panels of installations JT-60, HL-2A. The technical solution of KTM experimental data visualization system, is constructed on the basis of 12 liquid-crystal displays with a diagonal 46" and a special video controller connected to the personal computer PCI Express bus is presented.

UDC 004.032.26:621.362

Zimin V.P., Filippov M.M.
RESEARCH OF APPROXIMATION OF VOLT-AMPERE CHARACTERISTICS OF THE THERMOEMISSION CONVERTER BY ARTIFICIAL NEURAL NETWORKS

The problem of approximation of the family of experimental volt-ampere characteristics of the thermoemission converter by layered artificial neural networks is set and investigated. Laws and dependences are obtained, allowing estimating the quality of approximation at change of neural network parameters, training and testing samples.

UDC 614.8.001.24

Belyaev G.N., Teterin I.M., Yatsutsenko V.N., Reznik I.V., Artyushin Yu.I.
RISK CONTROL ON TECHNOLOGICAL FACILITIES

The concept of risk is a universal quantitative measure of potential danger. Having characterized the efficiency of action of those or other activities to decrease the risk, having the distribution of risk levels in economic equivalents, it is possible to estimate the applicability and importance of activity variants providing the optimum risk control on technological facilities.

UDC 338.2:614.8

Belyaev G.N.
METHODS OF DAMAGE ESTIMATION FROM TECHNOGENIC EMERGENCIES

The estimation of risk in a specific territory, including calculations of possible death-roll (suffered) people and economic losses which can be caused by dangerous phenomena, is carried out on the basis of the analysis of the territory danger, threats for people and facilities, their vulnerability and possible damage. The concept of damage and methods of its estimation from hypothetical and real failure are revealed in the article.