
Summaries

UDC 519.2

Kitayeva A.V.
**STABLE ESTIMATION OF SIMULTANEOUS TREND
OF A RANDOM SIGNAL AVERAGE AND DISPERSION**

Parametric robust estimations of simultaneous trend of average and dispersion of random process constructed by discrete independent observations similar to distribution quartile estimations by structure have been considered. Quartiles of noise distribution are supposed to be fixed. Strong consistency and asymptotic normality of proposed estimations are shown.

UDC 519.24

Skripin S.V.
**PROPERTIES OF COMPLEX REGRESSION ESTIMATION
AT FINAL SAMPLE VOLUMES**

Properties of complex nonparametric regression estimation using estimations of two constructed regression models – parametric and nonparametric have been given. Application of bootstrap method for the complex model allows obtaining estimations close to optimal ones by mean square deviation minimum criterion. Statistic simulation showed that at finite samples a complex estimation is more preferable than each of estimations of the constructed models.

UDC 504.064(4)

Zamyatin A.V.
**APPLICATION OF SPATIAL CHARACTERISTICS
AT SIMULATION OF LANDSCAPE COVER CHANGE
USING CELLULAR AUTOMATA**

The approach to simulation of landscape cover changes using cellular automata and 7 spatial characteristics commonly occurring at solution of geoinformatics various tasks allowing increasing simulation adequacy has been proposed. Search for self-descriptiveness of each characteristic in various extents of running window was carried out. The technique of estimating characteristic significance in various combinations when determining laws of cellular automata operation was proposed and characteristic significance was estimated. The results of the experiments were obtained using typical alternative data of raster geoinformation system Idrisi Kilimanjaro.

UDC 004.627

Zamyatin A.V., To Din Tryong
COMPRESSION OF MULTISPECTRAL RS IMAGES USING WAVELET AND INTRA-BANDS CORRELATION

Three-stage algorithm of compression of multispectral RS images patterns based on using wavelet transform and subject to intra-band dependence allowing to a large extent taking into account specific characteristics and increasing a degree of compression of remote sensing data has been suggested. Comparative investigations of efficiency of suggested algorithm and universal compression algorithms confirming its availability and allowing determining optimal depth of wavelet transform were carried out. The results of investigations showed

superiority of suggested algorithm in different degree over analogs in compression at more significant computing expenditures.

UDC 004.627

Zamyatin A.V., To Din Tryong
**INCREASING EFFICIENCY OF THREE-STAGE COMPRESSION
ALGORITHM OF MULTISPECTRAL RS IMAGES**

Modification of three-stage algorithm has been proposed and developed. It is directed to increase of RS images rate of compression using the approach to search for band-operation sequence as well as ways of increasing numerical efficiency of searching operation sequence based on application of truncate search and sampling data use. Multiple investigations of the proposed technique efficiency in comparison with universal compression algorithms were carried out on data of a number of systems of earth remote sensing showing in different degree superiority in compression efficiency and some lag from them in numerical efficiency.

UDC 004.9

Levashkina A.O., Porshnev S.V.
**STUDYING SUPERVISOR CRITERIA
OF ESTIMATING IMAGE SEGMENTATION QUALITY**

The technique allowing computing quantitative values of image segmentation quality indices has been described. According to this technique the comparative analysis of supervisor criteria of image segmentation quality rating was carried out: FOM, Hausdorff criterion, Badelly criterion, DKu, M, RMS, V, RI-criterion, GCE criterion, VI-criterion. Criteria which are appropriate to be used for estimating image segmentation algorithm quality were selected.

UDC 681.3.053

Potapov P.V., Korikov A.M.
**SEARCH ALGORITHM OF SIMILARITY VECTORS
AT VIDEO DATA COMPRESSION**

New search algorithm of similarity vectors at video data compression has been proposed. Use of this algorithm allows improving productivity and degree of video compression. Comparative analysis of suggested algorithm with analogs was carried out.

UDC 621.313.684

Shinkarenko K.V., Korikov A.M.
**ERROR-CORRECTING CODING OF MULTIMEDIA DATA
IN COMPUTER NETWORKS**

Error-correcting is aimed at increasing of reliability of information being transmitted over error-prone environment. However, traditional error-correcting codes do not allow to recovery data from packet losses occurring in IP networks. The present paper provides the analysis of application of erasure codes for packet losses recovery in digital multimedia over IP telecasting. It is concluded, that the erasure coding has perspectives for multimedia over IP telecasting, but it needs to be further developed. The novel non-random erasure codes (NREC) are proposed.

UDC 621.313.684

Shinkarenko K.V., Korikov A.M.
**UTILIZATION OF NON-RANDOM ERASURE
 CODES IN IP TELECASTING**

This paper presents the architecture of ITPV system which utilizes non-random erasure codes. A novel method of non-random erasure codes application at the level of MPEG-2 Transport Stream is described. The method takes into account the priority of MPEG-2 Transport Stream packets. The utilization of the non-random erasure codes is aimed at increasing of reliability of digital multimedia data transmitting over IP networks.

UDC 681.3.06

Pogrebnoy V.K., Sonkin M.A., Pogrebnoy A.V.
**OPTIMIZATION OF USING COMMUNICATION RESOURCES
 IN GROUND METEOROLOGICAL OBSERVATION NETWORK**

Lower link of ground meteorological observation network of Rosgidromet has been analyzed for optimization of using communication channel resources. The main diagrams of data collection organization from weather stations were extracted and mathematical statements of proper optimization tasks were stated. Basic variant of statement of a task as a task of mathematical programming of transport type was proposed. Multi-channel variant of task statement and single-channel one with a possibility of spare channel connection was given. Policy of sequential and collateral sampling of the primary and spare channel was examined. The example of solving the task at sequential sampling of channels was given.

UDC 681.3.06

Sonkin M.A., Shamin A.A.
**OPTIMIZATION OF OPERATION OF MULTI-CHANNEL
 DISTRIBUTED INFORMATION AND COMMUNICATION
 SYSTEMS FOR HARD-TO-REACH OBJECTS**

Criteria of optimization of data transmission in systems of meteorological information acquisition have been selected. Methods of estimation of time and cost of message delivery by specified communication channel were proposed on the basis of statistic data subject to the selected method of communication tariffing. Algorithms of data transmission optimization were worked out: by time of delivery, cost of delivery and reliability.

UDC 681.3.06

Slyadnikov E.E.
**SIMULATION OF DISTRIBUTED INFORMATION TELECOM-
 MUNICATION SYSTEMS WITH BATCH COMMUNICATION**

The model of distributed information telecommunication system with batch communication for hard-to-reach objects has been stated. It was shown that such system is described by power distribution law for probability of implementation of connection between two nodes and reveals properties of scaleless network (small world) possessing near structure as a homogeneous system and far structure like random systems.

UDC 004.056.55

Krainov A.Yu., Mescheryakov R.V., Shelupanov A.A.
**RELIABILITY MODEL OF INFORMATION TRANSMISSION
 IN PROTECTED DISTRIBUTED TELECOMMUNICATION
 NETWORK**

Approaches to construction of reliability model of security of distributed telecommunication network have been considered. Classical theory of reliability is proposed to be used for formation of system operation quality indices.

UDC 004.651.4

Borodin A.M., Porshnev S.V., Sidorov M.A.
**USE OF SPATIAL INDICES FOR PROCESSING DEMANDS
 AND AGGREGATING MULTIDIMENSIONAL DATA
 IN INFORMATION ANALYSIS SYSTEM**

The experiment of applying multi-dimensional indexing technologies used at processing spatial data for fulfilling analytical demands to

multidimensional data warehouses has been described. It was shown that use of dynamic structures allows not only increasing rate of analytical demand carrying out but solving more efficient the task of multi-dimensional data update.

UDC 004.89

Vasiliev S.S., Novoseltsev V.B.
**ON USING PROBLEM-ORIENTED LANGUAGES
 IN PROGRAMMING**

Popular approach to increase of efficiency of development process of reliable software which supposes systematic application of abstraction mechanism owing to use of so-called problem-oriented languages has been considered. Subject to the experience in the range of the given paradigm the advantages and disadvantages of the approach as well as perspectives of its development are analyzed and discussed.

UDC 004.89

Vakhitov A.R., Novoseltsev V.B.
**ADVANTAGES OF DESCRIPTIVE LOGIC
 AT KNOWLEDGE PROCESSING**

Fields of application of descriptive logics, basic terms as well as their main advantages in comparison with classical calculus have been discussed. Special attention is paid to possibility of descriptive logic application at knowledge processing; the examples of using descriptive logic in this field are shown. Principles of constructing inference for the discussed theory are examined.

UDC 004.89

Pinzhin A.E., Novoseltsev V.B.
**EFFICIENT ALGORITHM OF SYNTHESIZING PROGRAMS
 WITH CONDITIONS AND SUBPROGRAMS**

Algorithm of synthesizing programs with conditions and subprograms on the basis of given specification has been proposed. The algorithm allows achieving high productivity due to preliminary preparation of special data structures. Expenditures for program inference and extraction are characterized by linear function from functional relations declared in specification. The results of trial comparison with the existing algorithms are given.

UDC 004.89

Pinzhin A.E.
**ALGORITHM OF SYNTHESIZING PROGRAMS
 WITH EXPLICIT AND IMPLICIT RECURSION**

Theory of C-models is expanded by a notion of recursive sub-schemes. Algorithm of synthesizing recursive programs where expenditures for inference are characterized by polynomial function of third degree is suggested. Theoretical and experimental results of algorithm efficiency estimation are given.

UDC 519.685.1

Arykov S.B.
PROGRAMMING LANGUAGE ASPECT

Language of anisochronous parallel programming Aspect allowing presenting algorithms with the required degree of nonproceduralism has been considered. Its key features and syntax are described. By the example of matrix multiplication problem the capability of language Aspect in recording one and the same algorithm with different degree of nonproceduralism was shown.

UDC 681.32

Titov V.G., Lukin N.A.
**MACROS LANGUAGE FOR PROGRAMMING
 HOMOGENEOUS COMPUTING ENVIRONMENT MINITERA II**

Solution of one of the problems of developing programming environment for homogeneous computing environment consisting of locally connected processing elements has been considered. Language of macro description allowing comparing definitely arbitrary algorithmic construction of topology of processing element array is proposed.

UDC 004.89

Stoyanov A.K.
NEURAL NETWORK BASED ON POINT MAP

Possibility of point map implementation in neural network of direct distribution has been shown. The neural network model based on one-dimensional point map allows computing neuron parameters and their amount. The results of experimental check out of the model by the example of developing neural network-classifier are given.

UDC 681.3.06:681.323

Tarkov M.S.
MAPPING NEURONET ALGORITHMS OF IMAGE ANALYSIS ON REGULAR STRUCTURES OF DISTRIBUTED COMPUTER SYSTEMS

Algorithms of mapping weight matrix of the first (buried) layer of neural network on distributed computer systems with torus at parallel solution of problems of image analysis have been proposed. It was shown that selection of mapping device depends on the ratio of a number of neurons in the layer to a number of neuron weighting coefficients (image pixels). In particular, for Hopfield network, distribution on processors of weight matrix rows gives higher efficiency of computing paralleling than column distribution.

UDC 004.942

Afontsev E.V., Grebenkin M.K., Porshnev S.V.
ON SELECTION OF ROUTING BUFFER SIZE OF COMPUTER NETWORK LOADED BY HEAVY TRAFFIC OF REAL TIME

The results of simulation of data transmission by UDP protocol in network with channel limiting system capacity have been given. Different variants of selection of buffer size and channel loading factor are examined.

UDC 004.75

Soloviev B.A., Kalaida V.T., Elizarov A.I.
DISTRIBUTED SECURITY SYSTEM «LIK»

The examples of using complex of construction of distributed systems «Basis» have been considered. Components of face recognition system and access control «LIK» are taken as system functional elements.

UDC 681.3.06

Grinemaer V.V., Shamin A.A.
SOME PROBLEMS OF USING CRYPTOGRAPHIC PROCESSOR FOR COMMUNICATION SYSTEMS ON THE BASIS OF BATCH CONTROLLER «VIP-M»

Methods of protection at exchange of scrambled and source information in communication system with batch data transmission on the basis of «VIP-M» have been proposed. New protocol of data exchange between cryptographic processor and control device was developed.

UDC 553.044:518.5

Dmitriev Yu.G., Tarasenko P.F.
INTERPRETATION OF GEOLOGIC INFORMATION USING COMPUTER TECHNOLOGIES

Possibilities of computer technology application for processing and interpretation of geologic information of oil-and-gas bearing territory have been considered. Stages of analysis and computations are given by the example of Pervomayskii oil-and-gas bearing region.

UDC 519.254

Tarasenko P.F.
ON USE OF PARALLEL COMPUTING FOR ANALYSIS OF GROWING SYSTEMS

Mathematical models of growing systems have been given. Possibilities of parallel computing application using MPI standard at organization of sampling the variants of growing system probable composition were considered for these models. The method supporting adaptive a load uniformity of parallel processes was proposed.

UDC 550.053.510.2+550.053.681.3(571.16)

Ivanchenko V.P., Kochegurov A.I., Orlov O.V.
ANALYSIS OF MERIT FUNCTION OF ALGORITHMS OF PHASE-FREQUENCY TRACING OF SEISMIC WAVES

Generic definition of merit function at phase-frequency tracing of seismic waves has been considered. High resolution of phase-frequency tracing algorithm as well as presence of connection of merit function with petrophysical parameters of seismic media has been shown.

UDC 550.053.510.2+550.053.681.3(571.16)

Ivanchenko V.P., Kochegurov A.I., Orlov O.V.
PHASE-FREQUENCY CHARACTERISTICS OF SEISMIC WAVES AND PRINCIPLE PRECONDITIONS OF THEIR APPLICATION FOR SOLVING THE TASKS OF GEOLOGICAL SECTION FORECAST

Principle preconditions and possibilities of application of phase-frequency characteristics of reflected seismic waves for geological section forecast have been considered on the basis of analysis of information model of layered absorbing media. Behavior of generalized phase spectra of reflection coefficients was studied. It was shown that the greatest change of phase spectra of reflection coefficients is observed for gas-saturated collector.

UDC 681.3:002

Khakho I.Kh.
DYNAMIC CORRECTION OF SEISMIC SIGNALS IN THE TASK OF QUALITY AND SECURITY ANALYSIS OF ELECTRICAL EQUIPMENT

The technique of seismic signal formation subject to dynamic characteristics of studied equipment has been considered. It allows obtaining seismic signals having statistic characteristics of computed accelerograms of earth quakes and determining seismic stability of electrical equipment with specified degree of confidence of the obtained results.

UDC 681.3:002

Khakho I.Kh.
ANALYSIS, SIMULATION AND DEVELOPMENT OF PROBABILISTIC ESTIMATE ALGORITHM OF ELECTRICAL EQUIPMENT SEISMIC STABILITY

Dynamic characteristics of electrical equipment have been studied subject to probabilistic properties of seismic signals and dynamic characteristics of industrial objects. Experimental estimates of probability of propagation of full-size sample reaction maximums of electrical equipment were analyzed and preliminary probabilistic estimates of their seismic stability were obtained.

UDC 620.193.001.2/621.315.66

Borovkov A.A., Korses R.S., Mozilov A.I.
RING STRUCTURES OF AUTOMATIC CONTROL SYSTEMS FOR ENERGY CONTROL OBJECTS

Algorithm for constructing closed automatic control systems not using degenerative feedback as their basis on this system motion or so-called unbalance (error) between desired and specified motion has been discussed. Ratios for control action of the proposed algorithm were obtained. Algorithm availability in conditions of action of additive disturbance was analyzed. Fixed point of control algorithm was analyzed. The results of simulation were given.

UDC 658.012.011.56:681.324

Bogdan S.A., Kudinov A.V.
PRINCIPLES OF CONSTRUCTING DECISION-MAKING SYSTEMS FOR OPERATING MONITORING IN MES OF GAS PRODUCING COMPANIES

Functions of control services of gas producing enterprises have been classified. Using this classification the approaches to formation of decision-making systems for operating monitoring in gas producing companies were analyzed.

UDC 621.928.93+681.3.068

Aslamova V.S., Zhabei A.A.**AUTOMATION OF DUST COLLECTOR COMPUTING**

Computer-aided system of calculation of cyclone purification efficiency has been given. Calculations are carried out by well known methods and by the methods developed by the authors. The system gives the opportunity to users of suitable and rapid access to data from the base in which there is information on dust collectors, cyclone search by specified criteria.

UDC 004.4:32.973.26

Porshnev S.V., Aronson K.E., Solomakha I.V.**APPLICATION OF SSA METHOD FOR ANALYZING MANUFACTURING INFORMATION COLLECTED BY HEAT AND POWER PLANT INFORMATION COMPLEX**

The results of spectral analysis of technical and economic indices obtained by the method of principle components (Singular Spectrum Analysis – SSA) have been described. The results obtained using SSA methods were compared with classical spectral analysis (fast Fourier transformation). The obtained results were interpreted from manufacturing viewpoint.

UDC 004.896

**Baigozin D.V., Pervukhin D.N., Zakharova G.B.
DEVELOPMENT OF PRINCIPLES OF INTELLIGENT CONTROL OF ENGINEERING EQUIPMENT IN THE SYSTEM «SMART HOUSE»**

General principles of implementation of hardware-software system for intelligent control of engineering equipment in the system

«smart house» have been proposed. Principles consist in using standard equipment connected by open protocols of data transfer, selection of three control levels (physical, logical and intelligent) and application of distributed knowledge base assuming remote control. The approach is implemented by the example of study-methodological hydraulic desk.

UDC 004.023:658.78

**Tyulmenkov V.N., Ekhlov Yu.P., Zamyatina O.M.
MATHEMATICAL MODEL AND ALGORITHM OF SOLVING THE PROBLEM OF OPTIMIZATION OF PRODUCT ARRANGEMENT AT DISTRIBUTION CENTER WITH ADDRESS REPOSITORY**

Mathematical model and heuristic algorithm of solving the problem of optimization of product arrangement at distribution center with address repository have been developed. The proposed algorithm was experimentally investigated at distribution center of a group of companies «Lama», Tomsk; the developed method accuracy was estimated by evaluation procedure of lower bound.

UDC 519.81

**Mikony S.V., Burakov D.P., Garina M.I.
PRACTICAL LEARNING OF DECISION THEORY BY STUDENTS OF INFORMATION PROFESSIONS**

Stages of decision theory development have been considered. Features of modern state of this scientific area are noted. They are taken into account at aim specification and formation of laboratory work content for practical learning the decision theory by information profession students. Educational version of the system CVIR developed by the authors is used as a medium for work execution.