

CONTENTS AND ABSTRACTS

TRANSMISSION AND PROCESSING OF INFORMATION

L.A. Demidova, N.I. Nesterov, R.V. Tishkin. POSSIBILISTIC SEGMENTATION OF EARTH SURFACE IMAGES BY MEANS OF INTELLIGENT INFORMATION TECHNOLOGIES

Key words: earth remote sensing, hyper spectral shooting, segmentation, clustering, fuzzy c-means algorithm, possibilistic c-means algorithm, genetic algorithm, artificial neural network.

The problem of earth surface images segmentation by means of intelligent information technologies is considered. The application expediency of genetic algorithms for receiving suboptimum results of images segmentation on the base of fuzzy and possibilistic clustering algorithms is shown. It is offered to use artificial neural networks for specification of segmentation results received on the base of considered clustering algorithms3

A.E. Kuznetsov, A.S. Ryzhikov. REGRESSION ALGORITHM RO FORM CONTINUOUS IMAGE FROM ACCORDING TO RECRUITMENT SHOOTING

Key words: frames personnel surveying system, law coordinate correspondence, coordinates of corresponding points.

An algorithm for the synthesis of continuous images of the earth surface from separate non-overlapping frames is given. The algorithm is based on the definition of the law of geometric alignment of images of the same name based on the coordinates of points identified in general areas of adjacent frames. Examples of practical use of the algorithm for "gluing" frames received with a digital camera when shooting air are provided.....11

S.A. Larin, R.V. Tishkin. COMMON PROBLEM OF SHIP DETECTION WITH ONBOARD HIGH RESOLUTION RADAR IMAGES

Key words: radiolocation, marine surveillance, ship detection, velocity estimation.

The article describes common strategy of ship detection with onboard high resolution radar images, present methods of location detection, velocity estimation and classification as well as perspective directions of radar systems development.....15

P.S. Pokrovsky, A.A. Lisnichuk. RADIO SIGNAL SYNTHESIS ALGORITHM TO ADAPT DATA COMMUNICATION INTELLIGENCE SYSTEM TO INTERFERENCE EFFECT

Key words: adaptation of radio signals, data communication intelligence system, multiobjective optimization.

The algorithm of radio signal synthesis to adapt data communication intelligence system to interference effect is proposed. This algorithm is based on multiobjective optimization methods. It is shown that the synthesized signals increase radio noise immunity by more than 4 dB (compared to BPSK signal) with low level of envelope fluctuation.....20

A.Yu. Linovich. STRUCTURAL OPTIMIZATION OF ANALYSIS SUBSYSTEM IN MULTIRATE ADAPTIVE SYSTEMS

Key words: multirate signal processing, information, divergence, maximum entropy method.

Ideas of structural optimization in the multichannel filters with time-domain decimation are

discussed. A general problem statement of the optimal digital circuit design based on informational criterion is formulated. The measure of information is introduced through Kullback – Leibler divergence. Advantages of the proposed method are confirmed by the results of the distributed sensor network simulation supplied here26

RADIO ENGINEERING AND MEASURING SYSTEMS

Yu.N. Parshin, I.I. Frolov. RECURSIVE ESTIMATION OF AMPLITUDE-PHASE DISTRIBUTION AT OPTIMUM SPATIAL CHANGE STRUCTURE

Key words: recurrent estimation, quasi-linear filter, amplitude-phase distribution, antennas array, spatial structure.

Synthesis of estimation algorithm of amplitude-phase distribution antennas on antennas aperture is done. Equations for linear filtering of amplitude-phase distribution estimation as well as quasi-linear filtering of amplitude-phase distribution estimation by known phase distribution are derived. Performance analysis of recurrent estimation algorithms versus spatial structure of measurement is carried out. Optimal value of angular sector of measurements points is established. Recommendation of initial value choice of measurement vector for recurrent estimation filter is provided.....35

V.G. Andreyev, N.I. Kononenko, V.S. Belokurov. ORDER OPTIMIZATION FOR A MODELLING AUTOREGRESSIVE FILTER TO INVESTIGATE NOISE CANCELLATION SYSTEMS

Key words: autoregressive model, linear autoregression, spectrum, modeling of time series, Yule-Walker equation system.

We offer a method to optimize the order of modeling autoregressive filter (geared to minimize the mean square deviation between the output analytical and model spectra in noise cancellation systems). Experiments show that the suggested method ensures a 10...15-fold gain, as compared to the currently used methods in optimizing modeling orders (based on average square deviation between the analytical and modeling specters at the system input).....41

S.N. Kirillov, D.I. Lukyanov. STUDY OF EMOTIONAL STATE INFLUENCE ON HUMAN SPEECH SIGNAL PARAMETERS

Key words: emotional state of human, mel-filtering, band speech signal, speech signal characteristics dynamics, phonetic feature of speech signal.

The influence of the degree of emotional state on the parameters of speech signal in different frequency bands was shown. Overall significant voice band frequencies for different emotional states rights equal to 0,3-6,5 kHz was determined. The influence of mel-bandpass filtering on the level of emotional content of speech was studied leading to the results which showed the biggest influence of the bands corresponding to 2, 3 and 4 mel-filters. Changes in time characteristics of speech signal at different emotional state were investigated. The range of values for all phonetic features of considered emotional states varies from 1.5 to 4.....45

S.S. Mamonov, I.V. Ionova. STUDY OF PHASE LOCKED LOOPS SEARCH ENGINE BEATS

Key words: timing, limit cycles, phase-locked.

A mathematical model of phase-locked loops search engine is considered. Conditions for the existence of hyperbolic limit cycles of the second kind are received. The usage of hyperbolic invariant sets and the rotation of vector field for the cycles of the second kind can lead to the increase of system parameter by 20%. The example of a system with a sinusoidal nonlinearity, having burst beats is given.....52

V.G. Andreyev, T.P. Nguyen. CARDIOSIGNALS PROCESSING WITH CLUTTER AND NOISE AS BACKGROUND

Key words: electrocardiogram, clutter and noise, whitening filter, colored noise, adaptive signal processing.

In this paper we propose 2 simplified algorithms, which allow us to reduce the amount of computational cost of operations by a factor of 1.17 ... 4.9 as compared with optimal solution. In assessing the quality of these two methods of whitening, we have conclusion that the second method allows a gain of 1.8 ... 100 in the accuracy of coefficients of inverse clutter and noise correlation matrix with the first method 60

A.S. Lapshin, R.I. Kubalov. MODELING, OPTIMISATION AND EXPERIMENTAL RESEARCH OF MICROWAVE BROADBAND NOTCH ROD ELLIPTIC FILTER WITH COAXIAL-STRIP RESONATORS

Key words: broadband notch rod elliptic filter, computer modeling, experimental research, electric characteristics.

Modeling, optimization and experimental research of microwave notch rod elliptic filter with coaxial-strip resonators are represented. The results of modeling are compared with experimental data. Design and basic electric filter characteristics are given: frequency response, standing wave voltage ratio, reflectance distribution of electric and magnetic fields 64

COMPUTER ENGINEERING AND APPLIED MATHEMATICS*V.P. Koryachko, D.A. Perepelkin, M.A. Ivanchikova.* COMMUNICATION LINKS PAIRS CROSSING ALGORITHM IN CORPORATE NETWORKS OF MULTIPLE COMMUNICATION PROVIDERS WITH DIFFERENT COVERING AREAS

Key words: adaptive accelerated routing, routing algorithms, pairs crossing algorithm, dynamic changes, dynamic corporate networks, software defined networks, communication providers.

Mathematical model and adaptive accelerated routing algorithm in corporate networks of multiple communication providers with different covering areas which increases efficiency of its operation during dynamic load change in communication links are offered 68

V.A. Antipov, O.V. Antipov, A.N. Pylkin. GENERALIZED STRUCTURE OF ALGORITHMS OF ROUTING ON THE BASIS OF MESSAGES CONTENTS

Key words: distributed applications, integration, exchange of messages, routing.

Having as its basis the formal Publication/Subscription systems specification, a formalized approach to the development of algorithms of messages routing on the basis of contents is offered 76

V.V. Tarasov, V.A. Sablina. THE CONSTRUCTION OF THE CIRCUITS FROM FUNCTIONAL ELEMENTS WHICH ARE FREE FROM VIRUSES

Key words: Boolean functions with viruses, syntheses of reliable circuits from unreliable elements.

The circuits from functional elements in the basis $\{\&, \vee, \bar{\quad}\}$ are considered. Their Boolean functions $f(x_1, \dots, x_n, z_1, \dots, z_m)$ are described where x_1, \dots, x_n are usual Boolean variables and z_1, \dots, z_m are indicators of external influences. Such Boolean functions are called Boolean functions with viruses. Superposition of the functions with viruses can lead to circuits which are free from external influences and viruses 83

N.A. Smolyarov, I.N. Aksenov. RELIABILITY CALCULATION OF RESTORABLE SYSTEM WITH LOAD-MIXED RESERVE

Key words: reliability, redundant restorable system, load-mixed reserve, common switch.

Expressions for probability of failure-free operation of redundant restorable system with load-mixed reserve on unreliable common switch are obtained and calculation method based on this expressions is considered in this article 87

COMPUTER-AIDED DESIGN

S.V. Skvortsov, T.S. Skvortsova, V.I. Khryukin. PROBABILITY TECHNIQUE OF TOLERANCES AND FITS CALCULATIONS FOR CAD/CAM SYSTEMS

Key words: tolerances, deviations and fits, holes and shafts, coefficient calculation method, stochastic simulation.

The task of calculation of tolerances, deviations and fits for holes and shafts with random nature of their sizes is considered. The technique to solve this task taking into account the technological features of manufacturing and based on stochastic simulation is developed 92

O.V. Faleyev. SYNTHESIS OF TEST AUTOMATION SYSTEMS USING MEANS OF MODULAR COMPLEX

Key words: method of modular construction, synthesis of modular complex of means, systems for automation of tests.

The method of problem solution for synthesis of systems to be used in rocket-space techniques for tests automation is offered using modular complex of means 97

O.O. Golubyatnikov, V.V. Dubrovin, O.A. Ostapenko. EXPERT SYSTEM TO GET EXPRESS ESTIMATION OF HEALTH STATE

Key words: expert system, estimating health state, information model.

The article considers the expert system to get express estimation of health state and information models of expert system. Information models allow to present structure of expert system. 102

ELECTRONICS

T.S. Remizova. CALCULATION MOTION OF ELECTRONS IN DRIFT TUBES OF DOUBLE-CAVITY GENERATING-AMPLIFYING KLYSTRON WITH APPLICATION OF NONLINEAR COEFFICIENT OF REDUCTION

Key words: double-gap cavity, nonlinear coefficient of reduction, generator-amplifying klystron, space-time diagram (STD), electron efficiency, grouping process.

The ratios presenting one-dimensional electron motion in the grouping electron current in drift tubes of generating-amplifying klystron (GAK), allowing the operation of forces of a space charge are received. Investigation of space charge influence on generating-amplifying klystron parameters is made 107

I.E. Syrmolotnov. SAW-SENSOR PRESSURE WITH A MEMBRANE ELEMENT OF SQUARED SHAPE

Key words: membrane ESE, plate, membrane, curving moments, strains, SAW-sensor.

Comparison of curving moments for a rectangular and square membrane is spent. Values of relative curving moments depending on point co-ordinates are presented. Expressions to find strains on plate surface are offered. Major heterogeneity of strain figure in rectangular membrane in comparison with round one is proved 111

S.E. Igoshina, I.A. Averin, A.A. Karmanov. MODELING GAS SENSITIVITY OF POROUS FILMS BASED ON SEMICONDUCTOR OXIDES

Key words: gas sensitivity, semiconductor oxides, sol-gel technology, diffusion, fractal aggregates.

The model of gas sensitivity taking into account molecular and Knudsen diffusion of gases in porous films based on semiconductor oxides is developed. Experimental results of change of porous films resistance based on tin dioxide – silica dioxide, obtained by sol-gel process, being under the influence of gas - reducing agent - ethanol vapor are presented 115

D.V. Kuntushev, A.V. Kuntushev, A.V. Ivanov, A.S. Pakhomov. STUDY OF Cu_3Sn AND Cu_6Sn_5 INTERMETALLIC COMPOUNDS FORMATION PROCESSES AND THEIR INFLUENCE ON ELECTRONIC COMPONENTS RELIABILITY

Key words: intermetallic compounds, ultimate strength, soldered joint, reliability, microsection, radiographic control, thermal profile.

Mechanism of Cu_3Sn and Cu_6Sn_5 intermetallic compounds formation in soldered joints of electronic components, influence of soldering thermal profile on intermetallic compound growth and mechanism of intermetallic compound growth in the process of soldered joints aging have been analysed. Failure rate of soldered joints with intermetallic layer thickness of 10 μm has been determined..... 119

MANAGEMENT IN SOCIAL AND ECONOMIC SYSTEMS*O.A. Kozelkov.* MODEL OF COMPLEX EQUIPMENT OPERATORS ACTIVITY EVALUATION

Key words: estimation of personnel, personnel maintainance, technological equipment, mathematical modeling.

The problem of evaluation of complex technological equipment operator activity is investigated. A model of controlled equipment contingencies, constructed with the use of case-based approach is offered. The task of operator activity evaluation when working in critical systems is considered. Operator performance assessment model taking into account both human psychophysical parameters and specifications applicable to technical means and organizational decisions is offered. This model allows to assess the effectiveness of the operator as a link in "man-machine-environment" system taking into account the dynamics of changes in basic parameters. The example of multicriteria estimation of alternative variants of personnel and forming of preference clusters is given 126

V.A. Tsvetkov, E.L. Loginov, D.N. Efremov. FUNCTIONAL COMPETENCIES AND MANAGERIAL SKILLS SUPPORT THROUGH THE DEVELOPMENT OF DISTRIBUTED INFORMATION-COMPUTING ENVIRONMENT IN PUBLIC ADMINISTRATION AND KNOWLEDGE-INTENSIVE INDUSTRIES OF RUSSIA

Key words: integration, science, education, manufacturing, organizational model.

This article discusses the formation of a new organizational model to build an intelligent core of innovative technological infrastructure of higher education and science in Russia using a universal educational, scientific and industrial network with distributed data-processing environment 133

BRIEF REPORTS

A.N. Kovalev, F.N. Kovalev. DEFINITION OF SIGN OF THE ANGLE IN DIRECTION-FINDERS IN FORWARD-SCATTERING RADAR SYSTEMS

Key words: forward-scattering radar, phasic direction-finder, unambiguous measurement of azimuth, target without maneuvering, increment of phase difference of signals.

Problem of unambiguous measurement of azimuth in phasic direction-finder in forward-scattering radar system is considered. Uncertainty in the sign of the angle occurs from the usage of amplitude detection of sum signal in direction-finder receivers. The sum signal consists of direct signal from the transmitter and the signal reflected from the target. The methods of liquidation the uncertainty are proposed. In one of the methods, analysis of increment of phase difference of signals at the outputs of amplitude detectors in separated receivers is made: sign of the angle is opposite to the sign of phase difference of signals at the outputs of amplitude detectors. In another method, the analysis of the frequency of signals at the outputs of amplitude detectors is made: if the frequency is reduced then the phase difference gives sure sign of the angle; if frequency is increased, the sign of the angle should be changed to the opposite..... 137

A.V. Ksendzov, Y.N. Surkov. ANALYSIS AND APPROXIMATION OF POWER AZIMUTH SPECTRUM FORM

Key words: MIMO, spatial structure, power azimuth spectrum, bit error rate, noise immunity.

The effect of location characteristics on parameters of MIMO system model is considered. On the given example of location, the optimization of spatial structure of MIMO system is performed using simulation, a theoretical gain about 0,8 dB in signal-to-noise ratio is reached..... 140

O.M. Shynkaruk, V.R. Liubchik, M.O. Lantvoit. FORMATION OF SIGNALS WITH RECTANGULAR SPECTRUM AND MINIMUM CREST FACTOR

Key words: crest factor, signal with rectangular spectrum, maximum-minimum-problem, initial phase, function graph.

Results of the research showing how crest factor depends from the initial phases of spectral components of the signal are given. Algorithm of finding the initial phases of spectral components of the signal with a rectangular envelope of spectrum and minimum crest factor is proposed. To find the set of initial phases it was proposed to vary the initial phases along the lines of minima of crest factor in accord with adaptive method..... 143

V.A. Belokurov. OBJECT DETECTION IN LOW SIGNAL NOISE

Key words: detection, low signal to noise ratio.

The question to apply Gaussian filter in the problem of partial object detection in low signal to noise ratio is considered. It is shown that the signal to noise ratio of 13 dB (at the entrance of the algorithm), detection probability equals 0.8 to 16th review 146

N.M. Vereshchagin, V.V. Vasilyev, A.E. Korolev, K.V. Shemarin. MECHANICAL DESIGN OF CORONA DISCHARGE FAN ELECTRODE SYSTEM WITH ELECTRIC WIND MAXIMUM SPEED

Key words: corona discharge, electric wind, corona discharge blower.

In this paper experimental results of multi-electrode system of corona discharge blower are given. Air velocity is shown to influence mutual arrangement electrodes. Optimum ratios of parameters providing greatest flow velocity are determined 149

INFORMATION ABOUT THE AUTHORS (Russian) 153

INFORMATION ABOUT THE AUTHORS (English) 156