

CONTENTS AND ABSTRACTS

RADIOENGINEERING, RADIOLOCATION AND COMMUNICATION SYSTEMS

V.K. Klochko, A.N. Usachev, V.P. Kuznetsov, A.V. Levitin, A.V. Zhiritsky, V.P. Semiletnikov. MOVING TARGETS COORDINATES DETERMINATION ALGORITHMS ON THE BASIS OF MULTI-CHANNEL DOPPLER RLS

Key words: radar-location, Doppler RLS, moving targets coordinates estimation.

Moving targets coordinates determination algorithms found in multi-channel Doppler RLS, based on secondary processing of signals in temporary and spectral areas after preprocessing path passing are considered. Operability of algorithms is shown by the method of computer modeling3

V.I. Koshelev, A.Yu. Parshin. DETECTION OF MOVING EXTENDED OBJECT USING FRACTAL BROWNIAN MOTION MODEL

Key words: fractal Brownian motion, Hurst exponent, likelihood ratio, reflection factor, extended object, moving object.

The article deals with fractal model of moving extended object. The usage of fractal Brownian motion to describe complex reflection factor is proved. Detection algorithm for fractal extended object is developed by maximum likelihood method. The possibility to use fractal characteristic estimates is considered as moving extended object detection statistics. The approach to estimate object motion velocity according to its fractal size change is offered 11

E.V. Vasilyev, M.I. Timofeev. HIGH RANGE RESOLUTION SONAR

Key words: chirp linear frequency modulation, piezoelectric transducer, direct digital synthesizer, sonar, range finder.

The results of sonar design based on direct digital synthesizer are described. The developed sonar provides the better range resolution in comparison with traditional sonars based on piezoelectric transducer..... 17

A.A. Panchenko. MONITORING THE PERFORMANCE OF ELECTROMAGNETIC NOISE GENERATOR BY USING SOFTWARE-DEFINED RADIO DESIGNED FOR ASTRA LINUX OPERATING SYSTEM

Key words: monitoring, noise generator, performance evaluation, electromagnetic emanations, leakage prevention, SDR.

This article is devoted to the method and algorithms to be implemented in software component of SDR system aimed at performing continuous monitoring of the efficiency of masking electromagnetic emanations from PC by noise generator in order to detect the potential conditions for information leakage. Results of the evaluation of certified electromagnetic noise generator operating under control of cheap SDR device and the software developed under Astra Linux operating system are provided..... 22

COMPUTER ENGINEERING, INFORMATION SYSTEMS AND TECHNOLOGIES

S.V. Gavrilov, G.A. Ivanova. PERFORMANCE ANALYSIS OF COMPLEX DIGITAL CIRCUITS WITH UNCERTAINTY OF TECHNOLOGICAL AND CIRCUIT PARAMETERS

Key words: SP-DAG, IP-block, logic-timing analysis, static timing analysis.

This paper is dedicated to solve the problems of complex digital circuits performance analysis with the uncertainty of technological and circuit parameters. Traditional performance analysis of test stimulus sequence orders the events during time, while the proposed technique provides space ordering. This paper describes the method, which provides considerable logic level interval delay analysis accuracy versus the famous approaches accounting for the simultaneous multiple input switching29

A.D. Ivannikov. ALGEBRAIC MODEL FOR DIGITAL SYSTEMS SOFTWARE

Key words: software model, software as the product of operators, algebraic model, operators upon generalized memory.

The concept of an operator upon digital system memory is formally introduced on the algebraic approach basis. The concept of generalized memory consisting of memory cells, register contents, active operator label and current time value is introduced. An operator functioning upon generalized memory is formalized. Structural analysis of operator domain and operator range is made. The definition of operator product is introduced, the condition of such product existence is analyzed. Any digital system software is shown to be the product of operators, the set of operators being a semi group. The formal model developed is supposed to be used for the creation of digital systems software test generation.....36

S.N. Kirillov., L.S. Krupnov. DETECTION AND CLASSIFICATION OF NETWORK ATTACKS ON THE BASIS OF ARTIFICIAL NEURAL NETWORKS

Key words: artificial neural networks, network attacks, detection, classification, protection.

This article is dedicated to the idea of detection and classification of network attacks (NA), affecting distributed computer systems (CS). The problem in question can be solved with artificial neural network (ANN). ANN was learned using Clements-Hoffman mathematical model with addition of CS parameters formalization algorithm. Applying the resulting detection and classification system to CS allows quick automatical respond to NA. That leads to decreasing their effectiveness against distributed CS.41

D.A. Perepelkin, I.Yu. Tsyganov. IMPROVED ALGORITHM OF STRUCTURES SEGMENTATION WITH MINIMUM COST CRITERION IN CORPORATE NETWORKS

Key words: corporate networks, optimal structure, segmentation, segments, core network, topology, connectivity, adaptive routing.

Improved algorithm of structures segmentation with minimum cost criterion in corporate networks based on the data of core network structures and communication links connectivity is offered in the article. Segmentation of trees, mesh and partial-mesh topologies of corporate networks have been researched by the algorithm proposed.....48

E.A. Klenina. CLUSTERING PROBLEM RESEARCH OF OPEN API SITES DATA

Key words: API, clustering, similarity measuring.

The research of clustering problem of open API sites data is conducted. The choice of clustering method being the most effective in application to model data is made. Modifications of this method by applying different similarity measures are performed. Basic principles of working with open API sites and examples of clustering their data are investigated.58

A.K. Rozanov, A.V. Prutskov. METHODS TO INCREASE THE SPEED OF NATURAL LANGUAGE WORD FORMS MORPHOLOGICAL ANALYSIS ALGORITHM

Key words: string transformation analysis of words forms, automatic processing of text shaping.

The evaluation of the speed of the existing analysis algorithm of natural languages words forms is made, two ways to accelerate the process of analysis are offered, their advantages and disadvantages are described. The first method involves the use of baseline characteristics of elementary operations used to describe the formation of the rules. The second involves the storage of all known word forms in the dictionary. The gain in speed (five times for the first method and more than two orders of magnitude - for the second) is shown, the reasons for the observed increase in speed are given, some statistics about the dictionary of the Russian language formed in the course of experiments is offered. 65

SYSTEM ANALYSIS, INFORMATION PROCESSING AND CONTROL

M.T. Teryokhin. TWO-POINT BOUNDARY VALUE PROBLEM OF CONTROLLED MATHEMATICAL MODEL FOR STABLE DEVELOPMENT OF ECONOMIC SYSTEM IN THE CONDITIONS OF EXTERNAL INFLUENCES

Key words: volume of stabilization, volume of external influences, rank of matrix, minor, operator, fixed point.

Controlled mathematical model of the economic system with predefined boundary conditions is investigated. The conditions under which plan targets under external influences will be executed (or will not be executed) are defined. Admissible volume of external influences, in which the stable development of the economic system is possible for a given volume of stabilization is determined. 71

A.I. Bobikov, A.V. Shabirina. THE CHOICE OF WEIGHT MATRIX FOR SDRE CONTROLLER WITH PARTICLE SWARM OPTIMIZATION ALGORITHM

Key words: non-linear object, state-dependent Riccati equation method, particle swarm optimization.

One of the advantages of state-dependent Riccati equation (SDRE) method is not only the analogy with Linear quadratic regulator (LQR), but also the opportunity to achieve a "compromise" between control actions and errors relatively to the state variables by setting weighting matrix. In this paper we propose to configure this matrix for SDRE controller using a particle swarm optimization algorithm (PSO). In conclusion the proposed method has been successfully applied to the object in the form of a conical tank. 77

L.A. Demidova, Yu.S. Sokolova. APPLICATION ASPECTS OF PARTICLE SWARM ALGORITHM IN THE PROBLEM OF SVM-CLASSIFIER DEVELOPMENT

Key words: SVM-algorithm, classification, optimization, parameters of kernel function, regularization parameter, particle swarm algorithm, cross-validation.

Application aspects of particle swarm algorithm in the problem of SVM-classifier development for the purpose of the choice of kernel function type, values of kernel function parameters and value of regularization parameter, providing high quality of data classification, are considered. The results of experimental studies, confirming the use expediency of particle swarm algorithm in a problem of SVM-classifier development, are given. 84

I.V. Bodrova, O.A. Bodrov, D.A. Naumov. METHOD OF SCATTERING MATRIX COMPUTATION FOR METAL AND DIELECTRIC SURFACES OF TECHNOGENIC SPACE DEBRIS

Key words: Stokes vector, Mueller scattering matrix, technogenic space debris.

Mueller scattering matrix is made, spectral problem for metal and dielectric surfaces scattering technogenic space debris is solved. In the fotopolarimetrical studies distant space object can be described as a matrix called Mueller matrix. Mueller matrix elements depend on light beam incidence angle, optical properties and geometry of scattering surface. Mueller matrix allows you to find Stokes vector of scattered radiation from the solution of matrix equation93

M.N. Ryzhkova. DEVELOPMENT OF UNIVERSAL MODEL OF EDUCATIONAL SYSTEM WITH THE HELP OF CYBERNETIC APPROACH

Key words: universal model, structural model, cybernetic approach, educational system.

This article is devoted to the educational system model investigation. The requirements for the universal model of educational system are put forward, and structural model based on cybernetic approach in accordance with these requirements are developed. The versatility of the model is confirmed by partial models of educational system levels, derived from general model limitations and assumptions99

INSTRUMENT ENGINEERING AND INFORMATION-MEASURING SYSTEMS

E.V. Vlasova, E.I. Glinkin. MODELING OF BLOOD GLUCOSE FROM BLOOD PRESSURE

Key words: non-invasive glucose monitoring, modeling, structure-valued optimization, parameter optimization, calibration.

The structural and parametric optimization model based on blood glucose vs. blood pressure dependency being the basis of non-invasive detection of blood glucose concentration to raise metrological efficiency by matching process physics model correspondence is analyzed106

ELECTRONICS AND NANOELECTRONICS

V.A. Korotchenko, V.I. Solovyov, Zh.V. Putilina. ELECTROMAGNETIC, MECHANICAL AND ELECTRONICAL PROCESSIS AT SWITCH OFF OF SEALED VACUUM HIGH-VOLTAGE REED RELAYS

Key words: sealed vacuum high-voltage reed switches, electromagnetic, material point moving, electrical attraction, reed oscillates, autoelectronic emission.

The results of computer modeling and experiment investigation are represented for electromagnetic, mechanical and electronic processes at reclosing of high-voltage (to 5 kV) sealed vacuum reed switches MKA-40142. Resistance elements of magnetic circuit; coil current; coordinate of moving material point on reed end; magnetic, resilient and electrical forces, acting on point; gap voltage and autoelectronic current are given versus time from the coil voltage switch off in the range to 2,5 ms. It is proved that reclosing of reeds can follow relatively long (about 1 ms) state when reeds gap is very small (to 0.2 μm with oscillates at frequency 25 kHz – 50 kHz), that can lead to the distruction of protective Molybdenum coating of positive electron as the result of positive electrode being heated by autoelectronic emission112

A.A. Kornilovich, V.G. Litvinov. DETERMINATION OF LANDAU LEVELS FILLING FACTOR AND NEW INTERPRETATION OF FRACTIONAL QUANTUM HALL EFFECT IN 2D NANOSTRUCTURES

Key words: fractional quantum Hall effect, filling factor, quantum numbers, orbital magnetic moment.

A new interpretation of fractional quantum Hall effect in semiconductor nanostructures is discussed. Relations for determining the filling factor of Landau levels ν depending on the number of Landau level N , orbital l , m and magnetic spin quantum numbers s are obtained. It is shown that when $m = l = N$ integer quantum Hall effect appears, and when $m \leq l$ fractional quantum Hall effect is observed. The hierarchy of values ν in the quantum limit for $N = l$ is due to discrete changes of the orbital magnetic moment of the electron and its projection in the direction of the magnetic field. 122

E.V. Mamontov, V.V. Zhuravlev, V.N. Dvoinin, A.A. Salikov. ION ACCELERATOR FOR MOBILE TOF MASS SPECTROMETRY

Key words: space-time focus, linear electric field, monopole ion accelerator, ion accelerator with hyperbolic capacitor.

The problems of space-time focusing in ion accelerators of RF TOF mass analyzers ions are considered. It is shown that the use of ion-optical systems with two-dimensional quadratic potential distribution enables the space-time focusing according to initial coordinates in static and high-frequency electric fields. Two variants of ion-optical systems with linear ion accelerators fields are offered. Estimations of focusing properties of monopole accelerators and hyperbolic monopole type capacitor are received. 127

D.Yu. Tarabrin. ESTIMATION OF SPACE CHARGE INFLUENCE IN CATHODE MODULATE UNIT OF ELECTRON GUN

Key words: electron and ion optics, electron gun, Wehnelt electrode, crossover, space charge, perveance, electric field distribution.

This paper is about estimation of space charge influence in cathode modulate unit of electron gun using in electron auger-spectroscopy. Two estimation methods are considered. The first one is approximate analytical method and the second one is numerical method. Emission current density from the cathode was varied from 6 to 160 A/cm². It was found that we can neglect space charge influence in specified range of current density and with accelerating voltage 5 kV. The conclusion about correctness of considered estimation methods was made. 134

Do Kuang Man, B.A. Kozlov, A.B. Yastrebkov. INFLUENCE OF COOLING METHOD ON ENERGY PARAMETERS OF PULSE RADIATION OF SMALL-SIZED TEA-CO₂ LASERS

Key words: TEA-CO₂ laser; pulse radiation energy; pulse power; cooling method.

The dynamics behavior of pulse energy radiation of small-sized TEA-CO₂ laser which operates at pulse repetition rates up to 40 Hz when using air or water cooling methods is investigated. It is established that the use of air cooling method of the active medium stabilizes the value of pulse energy radiation at the level of 35-50 % of the initial value. The use of water cooling stabilizes the value of pulse energy radiation at the level of 85-90 % of the initial value. The stationary values of pulse energy radiation of 45 mJ and pulse power of 0.9 MW were obtained using the mixture of CO₂:N₂:He=1:1:6 and the pulse repetition rate of 40 Hz in TEA-CO₂ laser with the volume of the active medium $V_{AC}=10 \text{ cm}^3$ 139

A.E. Chizhikov, A.A. Lapshin, D.V. Suvorov, A.A. Zelenkevich, G.P. Gololobov, A.A. Serezhin, A.I. Moroz. RESEARCH OF CONTAINERS MULTILAYER DIELECTRIC STRUCTURE INFORMATION

Key words: complex dielectric permittivity, specific conductivity, multi-layer dielectric

structures, migration polarization, electric capacitance, electrode system of plasma panel plate, magnesium oxide film.

For two-layer and three-layer dielectric structures the relations for real and imaginary components as well as for the module of complex dielectric permittivity are given. We determine the range of values of specific volumetric electric conductivity of layers in which for layer thickness known from the measured value of electrical structure capacitance it is possible to obtain information on the magnitude of unknown values of the parameters of a layer. The experimental research has confirmed the analysis probability..... 144

D.S. Kusakin, V.G. Litvinov, N.B. Rybin, A.V. Ermachikhin, Yu.V. Vorobyov. ANALYSIS OF ELECTRICAL PROPERTIES OF THE POINT BARRIER METAL-SEMICONDUCTOR CONTACT

Key words: electrical properties, potential, point barrier contact, semiconductors structure, conducting probe of atomic force microscope.

The analysis of electrical properties of point barrier metal-semiconductor contact was accomplished. Point contact potential created by conducting probe of atomic force microscope was calculated. The possibility of the experiment realization was accomplished. 149

D.V. Suvorov, S.Y. Buvakov, G.P. Gololobov, M.A. Klyagina, A.A. Serezhin, A.I. Moroz. INVESTIGATION OF ELECTROPHYSICAL AND MORPHOLOGICAL PROPERTIES OF NANOSCALE FILMS SILVER DEPOSITED ON GLASS SUBSTRATE

Key words: nano-sized film, energy saving cover, silver, electromagnetic radiation, electrical conductivity, surface resistance, emissivity.

We obtained and studied a series of experimental samples of optical coatings, which are based on the functional layer of silver deposited on the glass substrate. Basic physical effects arising from the interaction of electromagnetic radiation with nanoscale conductive coating are studied. The results of studies of electro, thermal and morphological properties of nano-sized film of silver precipitated on the glass substrate under different..... 154

T.A. Glebova, A.A. Shishkov, V.I. Yurkin. MONOTRONS WITH IRREGULAR SHF FIELD

Key words: monotron, resonators, interaction space, irregular SHF field, efficiency coefficient.

Monotron modifications with unilateral toroidal and diaphragmatic resonators having the different SHF field distribution within interaction space have been considered. Conditions of efficient operating support have been discussed. Numerical computations and analysis of electronic processes have been carried out, and availability of power efficiency coefficient about 40% into a load in the monotron with diaphragmatic resonator has been shown 160

RSREU SCIENTISTS IN MONTENEGRO INTERNATIONAL CONFERENCE 165

INFORMATION ABOUT THE AUTHORS (Russian) 167

INFORMATION ABOUT THE AUTHORS (English) 169