MATHEMATICALMODELING. METHODS AND SYSTEMS OF INFORMATION PROTECTION, INFORMATION SECURITY

Izrailov K.E.

VISUALIZATION OF MULTI-CHARACTERISTIC VULNERABILITIES OF THE PROGRAM CODE USING THE METHOD OF MAIN COMPONENTS

The article discusses the problem of visualizing software vulnerabilities in a form suitable for an expert for analysis. Based on the fact that the number of vulnerability indicators can be huge, then to display them on a plane, a decrease in the data dimension is required. In the interests of this, it is proposed to use the principal component method from the field of machine learning, the application of which for a hypothetical example is given in the article.

Keywords: *information security, program, vulnerability, artificial intelligence, machine learning, principal component analysis, dimension reduction, visualization*

Potapychev S.N., Maly V.V., Ivakin Ya.A.

TECHNIQUE FOR RATIONAL PLACEMENT OF RECEIVING ANTENNAS OF POSITIONAL HYDROACOUSTIC COMMUNICATION SYSTEMS IN THE INFRASTRUCTURE OF DISPATCHING GEOSPATIAL PROCESSES

The paper considers the main features of making decisions on the placement of receiving antennas for positional hydroacoustic communication systems at the stage of designing the infrastructure for dispatching spatial processes based on modeling and visualizing the expected reception areas using intelligent geographic information systems (IGIS). The issues of intellectual support for decision-making on the rational spatial placement of receiving antennas are considered. An assessment of the influence of the quality of GIS information support on the accuracy of the results of calculating the expected reception areas of hydroacoustic communication systems in various hydrological and acoustic conditions has been carried out. A new indicator of efficiency in the form of the volume of the receiving area is proposed. This article is devoted to a meaningful disclosure of these concepts and indicators.

Keywords: *hydroacoustic systems, observation areas, hydrological and acoustic conditions, heterogeneous marine environment, intelligent geographic information systems, digital cartographic data, spatial data*

Sagdeev A.K., Shterenberg I.G., Shterenberg S.I., Vinogradova O.M.

DEVELOPMENT OF ERROR DETECTION AND CORRECTION UNIT FOR DIAGNOSTIC DEVICE OF DIGITAL INFORMATION TRANSMISSION CHANNELS

The article deals with the problem of the need to implement a network control system in the integrated with the ESE RF ITKS VN. To ensure network control, it is proposed to use a device for diagnosing digital information transmission channels. Digital signal processing in this device will be implemented on the basis of a neural network processor operating in a polynomial system of residue classes; a neural network will be used to detect and correct errors that occur when processing data in a neural network processor.

Keywords: *information and telecommunications network for military purposes, network control, neural network processor, polynomial system of residue classes, orthogonal bases, error correction*

Kushnir D.V., Shemyakin S.N., Orlov G.A.

PRESENTATION OF SOME ASPECTS OF CRYPTOGRAPHIC CRYPTOGRAPHIC CUTTING.

The article discusses methods for selecting parameters for cryptographic applications, in particular, methods for searching for large primes and issues of possible reduction of operations performed to search for primes of a certain type.

Keywords: *numbers, prime, compound, algorithm, feature, probability*

Minyaev A.A., Krasov A.V., Sakharov D.V.

METHOD FOR ASSESSING THE EFFICIENCY OF THE INFORMATION PROTECTION SYSTEM OF TERRITORIAL DISTRIBUTED INFORMATION SYSTEMS OF PERSONAL DATA

This article proposes a method for assessing the effectiveness of the information protection system of geographically distributed information systems of personal data. Conformity assessment of the personal data protection system of geographically distributed systems in accordance with the legislation of the Russian Federation is carried out in the form of a declaration of conformity. As a method, a combinatorial one is used for the most correct assessment, eliminating the disadvantages of existing methods, including

the often used expert one. The criteria for evaluating the effectiveness are proposed.

Keywords: *information security, declaration of conformity of a protection system, a method for assessing the effectiveness of a protection system for information systems, criteria for evaluating effectiveness*

Buinevich M.V., Izrailov K.E.

METHOD FOR CLASSIFICATION OF FILES BASED ON MACHINE LEARNING TECHNOLOGY

The article deals with the problem of classification of files, which is topical in the field of information security, including those with damage. For this, the frequency distribution of the bytes of the file was taken as an object, and the application of machine learning technology was taken as a subject. A system is proposed and its prototype is developed, which implements the method of distributing files into 4 classes, obtained by categorical division into pairs: dynamic vs static and binary vs text. Collected training and test samples of files. The results of the experiment on the classification of files by the prototype of the system showed high performance; the system's assessment of the reliability of such a classification is also assessed as high. The diagrams of the frequency distribution of byte files for all classes are given.

Keywords: *information security, forensics, file classification, machine learning, artificial intelligence*

Akhrameeva K.A., Gerling E.Yu., Radynskaya V.E.

AUTOMATION OF THE VISUAL METHOD OF STEGO ANALYSIS ON NZB

The article presents the results of a study of the possibility of automating the visual method of steganalysis for stegosystems with embedding in least significant bits. An algorithm for the automated visual method of steganalysis is proposed. To solve this problem, the Pearson correlation is used. Conclusions are made about the possibility of using this method with the calculation of the probability of a detection error.

Keywords: *stegoanalysis, Pearson correlation, investment share, probability of detection error*

Alzayadi L.Kh.

MATHEMATICAL AND COMPUTER TECHNOLOGIES FOR FORMATION OF PROBE-FORMING SYSTEMS OF HIGH ORDERS OF NONLINEARITY

This paper deals with the construction of so-called probe-forming (for example, "magneto-optical") systems designed to solve a wide class of problems in various fields of knowledge.

Keywords: *charged particle beams, probe-forming systems, magneto-optical systems, control system, symmetries of structural elements, matrix formalism*

Belov N.A., Chernenkaya L.V.

INTEGRATION OF TERMINAL MODULES INTO MODERN ALERTING SYSTEMS

The article describes a method for integrating end modules into modern Russian warning systems. A model of data presentation for a subsystem in a combined operational dispatch warning system is presented.

Keywords: *notification system, end module, data model, interface unit, interaction protocol, control point*

Moiseev V.I., Ksenofontova V.A.

A MATHEMATICAL MODEL FOR COOLING A STRATIFIED HOT OIL PRODUCT IN A RAILWAY TANK

The paper discusses the possibility of reducing the cost of rail transportation of viscous oil products in the winter season. A mathematical model of thermal stabilization of viscous oil products in a railway tank car is built by transferring the still hot transported liquid oil product into a stratified state, in which there is practically no natural convection, which is the main mechanism of its cooling.

Keywords: *viscous petroleum products, railroad transportation, stratified state of liquid petroleum product*

Karelsky P.V., Zuev I.P., Kovtsur M.M., Yurkin D.V.

RESEARCH AND EVALUATION OF THE MOST SIGNIFICANT QUANTITATIVE CHARACTERISTICS OF MPLS EQUIPMENT

The article is an analysis of the characteristics of operator equipment for building MPLS networks, which will be important for assessing the proposed purchasing units for network modernization. The paper considers the main characteristics of devices and analyzes the most significant of them, as well as estimates the consumption of equipment resources when organizing L2 VPN services. An analytical dependence is proposed for assessing the required equipment resources when introducing L2 VPN services. A practical experiment was carried out to confirm the theoretical conclusions on such a characteristic as the number of LDP neighbors. The results of the experiment are presented and conclusions are drawn about the significant characteristics for MPLS equipment for the L2 VPN service.

Keywords: multi-protocol label switching, experiment

Pereborova N.V., Makarova A.A., Chalova E.I., Alexandrova M.I.
MATHEMATICAL MODELING OF RELAXATION PROCESSES OF POLYMER TEXTILE MATERIALS FOR THE PURPOSE OF ESTIMATING THEIR FUNCTIONAL PROPERTIES

It is proposed to use mathematical modeling of the relaxation properties of polymeric textile materials to assess their functional properties. The study of the functionality of these materials allows us to make recommendations for improving their quality characteristics and creating competitive products.

Keywords: *polymer textile materials, relaxation processes, mathematical modeling, system analysis, computer forecasting, functional properties*

Pereborova N.V.
CRITERIA FOR QUALITATIVE EVALUATION OF RELAXATION PROCESSES OF POLYMER TEXTILE MATERIALS FOR THE PURPOSE OF EVALUATION OF THEIR OPERATIONAL PROPERTIES

The developed criteria for the qualitative assessment of the relaxation processes of polymeric textile materials are proposed to be used for the design of new competitive textile products with a given functionality. These criteria make it possible to carry out a qualitative assessment of the relaxation properties of polymeric textile materials, which significantly reduces the technical and economic costs of designing new textile products, since there is no need to manufacture their pilot batches.

Keywords: *polymer textile materials, relaxation processes, mathematical modeling, quality assessment criteria, performance properties*

CHEMICAL SCIENCES

Kiselev A.M., Dashchenko N.V.
NANOTECHNOLOGIES IN THE TEXTILE INDUSTRY

An overview of innovative Russian and foreign developments in the field of creating intelligent textiles using nanoscale systems and nanotechnological processes is presented.

Keywords: *nanoscale system, nanotechnology, smart textiles, property, field of application, competitiveness*

Ganiev I.N., Dzhaloev J.Kh., Rashidov A.R., Yakubov U.Sh., Zuvaidullozoda F.Z.
OXIDATION KINETICS OF ALUMINUM-NICKEL ALLOYS IN THE SOLID STATE

The kinetics of oxidation of aluminum-nickel alloys containing up to 0.5 wt% nickel has been studied by thermogravimetry. It was found that the addition of nickel to aluminum increases its resistance to solid state oxidation. It is shown that the oxidation of alloys proceeds according to a hyperbolic mechanism and is of the order of 10-4 kg · m-2 · s-1.

Keywords: *al-ni alloys, thermogravimetry, oxidation, true oxidation rate, activation energy, oxidation products*

Portnova T.M., Gukova N.V., Vitkovskaya R.F., Smirnov A.O., Bodyagin A.O.
INNOVATIVE TECHNOLOGIES IN THE PROCESS OF OBTAINING DRINKING WATER IN THE SUE "VODOKANAL OF ST. PETERSBURG"

The article presents the data of pilot tests at the waterworks in the city of Petrodvorets "State Unitary Enterprise" Vodokanal of Saint Petersburg "" to reduce the corrosive activity of water by changing the composition of the filter media. The experience of introducing modified dolomitized calcite at a drinking water conditioning station in the city of Petrodvorets was demonstrated. A study was carried out to select the optimal parameters for controlling the technology for reducing the corrosiveness of drinking water.

Keywords: *water treatment, drinking water, modified dolomitized calcite, corrosion, corrosiveness of water*

Treiman M.G., Induchny P.Yu.
PROSPECTIVE WASTE WATER PURIFICATIONS - COMPARATIVE ANALYSIS OF DOMESTIC AND FOREIGN PRACTICES

The study analyzes the domestic and foreign experience of using various types of biological treatment in the practice of modern enterprises of the water and sewage system. The article analyzes the domestic experience on the example of St. Petersburg - the processes of water disposal are considered and an overview of treatment facilities in the city and their characteristics is given, as well as the prospects for the development of urban and suburban treatment facilities. The following is a foreign experience in the

implementation of a biological treatment system with treatment facilities using the BioKos technology, which are widely used in Germany. This method of purification is less costly, allows a more complete use of resources, reduces the production area required for treatment facilities, and improves the quality of wastewater treatment.

Keywords: *biological treatment, wastewater treatment plant biokos, resource-supplying enterprise, balance of water disposal, sedimentation tanks, anaerobic digestion*

Khasanova S.Kh., Shamanov Sh.Kh., Nabieva I.A.

STUDYING THE POSSIBILITY OF FORMING AND COLORING FIBERS FROM LOCAL POLYETHYLENE REFTHALATE GRANULES

The paper presents the results of spinning and coloring polyester fibers obtained in a laboratory spinning machine. The possibility of uniform and durable dyeing of fibers formed from PET granules with a dispersed dye in the presence of salicylic acid plasticizer has been established.

Keywords: *forming, polyester fiber, sorption, dispersed dyes, dyeing*

AUTOMATION AND CONTROL OF TECHNOLOGICAL PROCESSES AND PRODUCTIONS

Wolfson I.I.

OPTIMIZATION OF DYNAMIC CHARACTERISTICS OF MACHINE UNITS WITH VARIABLE POSITION OF THE CENTER OF MASS

A study of the dynamic characteristics of machine units with allowance for the displacements of the center of mass is carried out. With regard to the system under consideration with rheonomic constraints, a method has been developed for crossing the zones of parametric resonance without violating the conditions of dynamic stability.

Keywords: *oscillations, variable parameters, parametric resonance, dynamic stability*

Peshekhonov A.A., Mitroshin D.G., Rudakova I.V., Chernikova A.V.

OPTIMIZATION OF THE AUTOMATIC DOSING PROCESS OF BULK MATERIALS

Innovative methods and means of optimizing the control of the consumption of bulk materials are considered. The results of experimental research and modeling of continuous and discrete automatic systems for regulating the flow of the solid phase in a two-phase flow "gas - bulk material" are presented. By the method of multicriteria optimization, the value of the main operating parameter is determined, which provides a compromise optimum of the main operating parameters. The results of this study can be used to synthesize pneumatic dispensers for bulk materials.

Keywords: *bulk materials, pneumatic control, discrete batcher, optimal performance, multi-criteria optimization*