MATHEMATICAL MODEL OF DATA CONVERSION IN PRINTING SYSTEM (p. 4-8)

Valerii Avramenko, Anton Paramonov

Today printing industry witnesses such trends as rapid growth of the products quality and transition from specialized systems to universal, releasing various printing and multimedia products.

It leads to significant increase of the processed data and substantial change in the structure of information flow in printing systems. As a result, the existing mathematical models of data conversion do not fully correspond to the actual processes.

The paper analyzes the information flow of preprinting production stage of the modern printing system. The unified flow has been singled out, for which, using statistical and regression analysis, the adequate mathematical model has been developed. The model has been adapted for simulation in general-purpose computing environments.

The obtained results can be used for the data conversion simulation in the printing system, for designing efficient and reliable computing networks, and for workflows optimization at the printing companies

Keywords: mathematical model, information flow, data conversion, printing system

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EFFICIENT RATING OF PARAMETRICAL CONTROL, USING STATISTICAL MODELING METHOD (p. 8-10)

Pavel Shchapov, Ivan Kambaiev, Ivan Tyshchenko

This article shows us the use of statistical methods for the analysis of information systems, which are used to monitor violations of precision transducers.

The purpose of the article is to discover opportunities of new information technologies for measuring transformations that are used to control the structural accuracy of transducers, when there are no samples of measured values.

We consider two information structural models of outputs duplicated transmitters. Using of probabilistic and statistical models for the outputs of the converter duplicates allows us to estimate the residual variance of the signal and to identify the difference of these dispersions as an informative parameter.

We can consider differential control method as a method of obtaining measurement data, because of the discrepancy in accuracy characteristics of duplicate transmitters. The theoretical explanation for the differential method of disassembling control information, where we can see the difference between the residual variance, is used in comparable structural transformations of models that are functionally dependent on the correlation properties of the output signals of the transducers. The results of the statistical modeling in information transformations, which were used for error control in random measurement signals are shown in the article

Keywords: reliability, information, control, model, dispersion, factor, transmitter, uncertainty

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MATHEMATICAL MODEL FOR ERGONOMIC EVALUATION OF WIND POWER STATION ACOUSTIC ENVIRONMENT (p. 11-15)

Olena Parhomenko

The paper considers the issues of improving the ergonomic system «employee - wind turbine- environment» on the noise factor for workers' labor activity at wind power station. The main objective of the study is developing a mathematical model for estimating the levels of sound pressure from wind turbines. The presented investigations are based on a study of physical processes foundations related to the acoustic effect on the system «employee - wind turbine- environment», statistical analysis of experimental data and mathematical modeling of wave processes. As a result of mathematical modeling, analytic expressions were obtained that can be used for engineering calculations of levels of sound pressure from a wind turbine which in turn will improve the ergonomic system «employee - wind turbine- environment» (stabilization of noise mode by choosing the optimal location of wind turbines at wind power station during design or reconstruction of existing station).

Keywords: ergonomic system «employee - wind turbine - environment», improving, noise factor, mathematical model

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NUMERICAL METHODS FOR DETERMINING THE RESPONSE IN A DYNAMIC MODE (p. 16-18)

Yuri Filipski, Ludmila Fonar, Andrei Bryanskii

The transient processes lead to the fact that the calculations should be done in a dynamic state of the circuit. Therefore, the low-pass filter, functioning as integrator and used in most radio devices up to power supply units, should be analyzed in real time, i.e. in a dynamic mode.

The method of transmission dynamic coefficient is of some interest, it differs from the stationary coefficient because it involves not only the instantaneous frequency value, but also the values of phase derivatives with respect to time. When determining the dynamic system output signal it is necessary to use z-conversion, allowing to eliminate the calculation errors which occur due to the limited frequency properties.

Taking into account that the circuit remains in a dynamic mode for a long time, the calculation of passage of the limited sequence of rectangular pulses was carried out, spectral density at the circuit output was determined, z-image of the input signal and transmission coefficient were received, the signal at the circuit output was figured out.

Using the z-conversion allows improving the accuracy of calculations and further determination of dynamic features of integrator. It can be concluded that, indeed, the circuit remains in dynamic mode for a long time. Each subsequent pulse at the circuit input causes the next stage, i.e. gradual voltage increase at the output

Keywords: low-pass filter, integrator, rectangular pulse, dynamic mode

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DETERMINATION OF MATHEMATICAL MODEL OF TRANSPORT MOBILITY OF POPULATION (p. 18-21)

Victor Dolya, Igor Ivanov

A series of recent studies shows that changes in social, economic and environmental indicators and urban passenger transportation parameters lead to a distribution of passenger flows, both between urban public transports and separate routes.

Previously, it was believed that the transport mobility depends mainly on the number of urban population and the level of car ownership, but today there are more factors. Therefore, specialists focused their attention on studying the effect of urban population age and sex, trip purpose, income levels, the city or suburb, trip time etc. on the transport mobility.

The paper considers the impact of transport, city planning, social and economic factors on the transport mobility. It allows confirming that the overall population mobility is the proportion of the urban population number, car ownership level, of transport and route network density.

As a result of the research, it was found that the effect of such factors as the number of urban population, level of car ownership, transport network density on the urban population mobility is directly proportional and the effect of route network density is inversely proportional. In particular, an increase of car ownership leads to an increase of driving the individual transport, which reduces passenger flows, number of routes and route network density respectively

Keywords: transport, population, mobility, factor, car ownership, density, network

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FUNCTIONAL TASK OF ASSESSING THE INFLUENCE OF HARMFUL PRODUCTION FACTORS ON PEOPLE (p. 22-26)

Natalia Serdyuk

The researches have shown typical information systems of working conditions management are virtually absent, and exist-

ing IS and technologies are focused on formation and keeping of various types of report documentation. A complete lack of analysis and forecasting of situations, the results of which can be used in planning or management of working conditions at the enterprise, leads to the cases of contingencies and emergencies, as well as to management decisions delay.

There is a need for developing the models and methods for solving the problems of monitoring, analysis and forecasting of changes of working conditions at the workplace.

Using the proposed models of assessment of a harmful production factor or a number of factors influence on the human body allows timely preventing contingencies on controlled object using the results of harmful factors measurement. The proposed formal specification allows considering the forecasting issue in IS of working conditions management at the enterprise as a special case of classification problem

Keywords: working conditions, levels of harmful factors, total load, technological process, staff

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COMPARISON OF TELEVISION BROADCASTING STANDARDS BY ANALYTIC HIERARCHY PROCESS
(p. 26-31)

Valeriy Bezryk, Yulia Skorik

Today, there are different standards for television broadcasting, each of them is characterized by a set of controversial technical and economic indicators. For choosing a preferable standard and its implementation in broadcast television networks, it is necessary to use methods of multi-criteria selection of optimal designs.

The paper analyzes and compares two standards of digital TV broadcasting: DVB-T standard with multi-frequency modulation COFDM and ATSC standard with 8-level single-frequency amplitude modulation with vestigial sideband SSB-8T. The standards are compared using the Saaty method taking into account a set of quality indicators.

Some quantitative results are given, characterizing the practical aspects of applying the method of Saaty for choosing the preferable variant of television broadcasting.

The analytic hierarchy process was considered, which allows formalized selection of the optimal design with a set of quality

parameters based on subjective judgments of experts. As a result of the expert survey, the matrixes of paired comparisons of quality parameters and speech codecs were formulated. After processing of expert judgments the corresponding eigenvectors and vectors of priorities for different levels of the modulation comparison hierarchy were estimated.

These estimations were used for calculating the parameters of priorities global vector components. According to the analytic hierarchy process based on the maximum value of the priorities global vector components the preferable standard of television broadcasting DVB-T with a multi-frequency modulation SOFDM was chosen.

Keywords: standard, modulation, optimization, hierarchy, matrix

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METHOD OF VITAL DIAGNOSTICS OF COW GONADS USING DISCRIMINANT ANALYSIS
(p. 32-35)

Tetiana Utytskykh, Oleg Avrunin, Oleg Getmanets

Despite numerous methods of animals breeding control, infertility prevention and healthy offspring problems remain the most important issues of veterinary science. The paper gives and analyzes the results of ultrasound examination of cow gonads: (width, length, presence of follicles) in normal and pathological conditions.

The paper also gives the program interface for determining the density of gonads. Based on the ultrasound data, the method of discriminant analysis (the method of binary comparison) has been applied for pathology diagnosis of gonads and grouping them into diseases by certain features (hypofunction of the 1st stage, hypofunction of the 2nd stage, sclerosis and atrophy) and comparing them with the norm.

The proposed method of vital diagnostics of gonads allows reliable diagnosis of cows ovarian pathology and can be used along with other diagnostic methods for increasing the accuracy and credibility of researches and making correct diagnosis with high probability

Keywords: reproductive function, gonad diseases, ultrasound, diagnostic methods, discriminant analysis

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FUZZY MODEL FOR ASSESSMENT OF COMFORTABLE CONDITIONS DURING DESIGN OF AIR CONDITIONING SYSTEMS (p. 36-40)

Nikolay Babich

The primary and highly important step in the process of designing individual objects and their systems is developing the Terms of Reference (TOR) for design.

The most important requirement for the TOR lies in its completeness. The more detailed information the mechanical engineer obtains, the more certain timeframes and quality of design will be. Today, when designing air conditioning and humidification (C&H) systems, most engineers use regulatory documents.

But it is becoming increasingly important to take into account individual characteristics of a person during the formation of comfortable conditions parameters.

It should be noted that there are many individual parameters and it is quite difficult to define clearly the required vector of such parameters, as well as the values for each of them; hence, a fuzzy logic method should be applied.

As a result of simulation, a fuzzy model was developed for assessing comfort conditions in living accommodations.

Fuzzy model will greatly improve the quality of design works, namely the formation of technical documentation about design objects

Keywords: fuzzy model, individual characteristics, comfort conditions, temperature, relative humidity, design

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ESTIMATION OF NEAR ASTEROIDS COORDINATES ON CCD-FRAME (p. 41-44)

Nataliia Sokovikova, Vadim Savanevych, Mihail Bezkrovniy, Sergii Khlamov

The development of computational methods for highly precise estimation of near-Earth objects coordinates on a sampled image is of current importance nowadays due to a significant increase of penetrating power of optical systems.

In this regard, it becomes much more difficult to achieve the required accuracy of observations of near-Earth objects with statistically dependent images.

The paper proposes a method that allows potentially accurate estimation of coordinates of several near-Earth celestial objects on the CCD-frame.

The developed method is based on the OLS assessment of parameters of statistically dependent objects images.

The optimization problem of minimizing the sum of squared residuals (between theoretical and experimental brightness of the CCD matrix pixels) can be solved by the Levenberg-Marquardt algorithm.

The developed method can be used in the systems of concurrent automatic detection of asteroids, for example, in the program CoLiTec, for estimating the coordinates of several near-Earth statistically dependent objects

Keywords: near-Earth objects, statistically dependent images, assessment of image parameters, asteroids

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METHOD FOR CALCULATING THE INTERSECTION POINTS OF METEOR STREAM ORBITS WITH A PLANE (p. 45-49)

Stanislav Borbulyov, Yuriy Voloshchuk, Yuriy Cherkas

Current functions of orbit elements distance in space (Dsh–Sutvort's and Hawkins's criterion, Dr–Drumond's criterion, etc.), despite the same goal, can give significantly different distance parameters for one and the same range of input parameters, and even for one of the same pair of orbits.

In general, each of the existing D-criteria is acceptable for determining the distance between orbits only in certain areas of possible orbits.

The research describes a method and algorithm for calculating the intersection points of meteor orbits with a plane, perpendicular to the mean orbit of meteor stream at a given angle of true anomaly.

The position of these intersections in characteristic points of the mean orbit allows investigating the fine structure of a meteor stream and checking the stream allocation quality using the D-criteria. This method will help to resolve controversial situations, when different D-criteria provide substantially different distance parameters for the same orbits.

Keywords: orbits intersections, meteor streams, penalty functions, D-criterion, distance, orbit, meteor

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DEFINITION OF OPTIMAL DRIVING RANGE OF ELECTRIC VEHICLE CONSIDERING ITS MAIN PARAMETERS (p. 50-55)

Nikolai Slipchenko, Viktor Pismenetsky, Mykhailo Gurtovyi, Vera Makhlova

Simulation of electric vehicle (EV) operation modes allows evaluation of important parameters such as driving range, acceleration, capacity and type of storage battery. At present time, analytical dependences of EV mileage on the depth of battery discharge are virtually absent.

The task of analyzing and modeling EV parameters and features is of current importance and practical interest to developers and automakers.

Based on driving range simulation algorithm, computational experiment was conducted with further analysis of experimental data.

Analysis and modeling of the EV main parameters provided concrete results of dependences of battery discharge depth on driving range for different payload masses. It is shown that driving range decreases with increasing payload mass in a standard urban driving cycle.

The study of dependence of driving range on battery capacity and EV speed was conducted by regression method. The paper gives the search for the EV speed and battery capacity optimal values by the maximum driving range criterion according to the method of gradient descent.

As a result of two-parameter optimization the optimal speed values of EV with the mass of 1.4 tones were obtained (30 km/h and 85 A/h)

Keywords: driving range, electric vehicle, depth of discharge, power, computational experiment, parameter

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PROPERTIES OF CONTINUOUS FUNCTIONS ON A COMPACT (p. 55-57)

Dheaa Kamel Hussain Al-Janabi

The work deals with the definition of a continuous function, definitions of a continuous function by Cauchy, Heine, in the increment language.

The properties of continuous functions on a compact (on an interval) have been studied comprehensively. The 1st and the 2nd Weierstrass theorems, the 1st and the 2nd Cauchy theorems are presented, as well as the main corollaries of them.

The proofs of theorems and corollaries are presented step by step. Sequentially compact sets are important because continuous functions defined on sequentially compact sets have some very useful properties, which they do not have in general when defined on non-compact sets

Keywords: continuous functions, compactness, The Weierstrass theorem, The Cauchy theorem

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FORMING A SET OF ALTERNATE VARIANTS OF TRANSPORT AND TECHNOLOGICAL CONTAINER CARGO DELIVERY SYSTEMS (p. 58-60)

Vitalii Naumov, Natalya Potaman, Natalya Viter

Transport and technological system of cargo delivery in containers is a complex system of interacting elements, so for solving the problems of planning the delivery systems structure it is appropriate to use the methods of system analysis, the essence of which lies in identifying the relationships between research object components and in estimating the effect of each component on a whole system functioning.

To solve the problem of forming a set of delivery system structures it is necessary to preliminarily analyze the available transport market participants, which may be involved in the delivery of the cargo consignment. The proposed method provides a complete set of alternative patterns of delivery system for a given market situation, taking into account the geographical parameters of orders for containers delivery.

The paper presents the theoretical basis for the formation of the complete set of alternative cargo delivery systems. Examples of the proposed methodology application for the formation of alternative sets of containerized cargo delivery systems have been given in the article.

The necessity of using the proposed approach in solving the problem of choosing the optimal cargo delivery variant has been shown

Keywords: transport and technological scheme, set of alternatives, containerized cargo delivery

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ANALYSIS OF THEORETICAL APPROACHES TO IMPROVE THE LO-GISTICS MANAGEMENT IN TRANSPORT NODES (p. 61-64)

Yevgen Nagorny, Vitalii Naumov, Tatiana Omelchenko, Yana Litvinova

Solving the problem of improving the efficiency of transportation company customers' service processes, the large number of factors that determine the basic parameters of technological processes and characteristics of their organization should be taken into account.

At the present stage of transportation science development the logistics management approach is considered as the most appropriate and correct.

The article analyzes contemporary theoretical developments in the area of improving logistics management of various modes of transport, storage and processing of cargos in transport hubs. The features of existing models have been determined, and the type of performance criterion for further research in the field of logistics management in transport hubs has been justified

Keywords: logistics management, transport modes interaction, transport node

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TRENDS OF MODELING THE SOCIAL RISKS OF ROAD TRAFFIC ACCIDENTS (p. 64-67)

Alexander Ryabushenko

The paper considers approaches and methods of assessment of human health and safety risks related to road traffic accidents (RTA). It must become one of the key indicators when analyzing negative social and economic consequences of road traffic accident rate, and developing the state policy of the road traffic safety improvement. The paper gives models, which can be used for analyzing and evaluating the RTA risks, as well as economic and social losses caused by RTA.

In the most general way the RTA risk value can be expressed as the product of event and consequences probability. Therefore, one and the same risk can be caused either by high probability of RTA with minor consequences or limited probability of RTA with a high level of losses.

The quantitative risk evaluation models, presented in the paper, do not completely show real mechanisms of the RTA emergence and development in different road traffic situations, elements of a road network. Therefore, each specific analysis case requires an appropriate risk evaluation model, which allows getting accurate results with the least expenses for calculation and source data collection

Keywords: traffic safety, road traffic accident, risks, social harm, the RTA risk modeling

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APPLICATION OF A FUZZY SET THEORY FOR SUPPLIER'S SELECTION (p. 68-70)

Helena Kuimova, Valentina Loganina, Tatiana Uchaeva

The paper gives information on methods of supplier's selection assessment based on the fuzzy set theory. The decision-making algorithm is presented.

The concrete example is cited concerning cement supplier's selection for one of the construction enterprises in Penza when producing reinforced concrete. The supplier's criteria were price, quality of supplied raw materials, available free space for power increase and reliability.

For estimating the weight coefficient values, matrix of pairwise criteria comparisons was formulated. Matrix of multiplicative quantitative assessments was made. A set of optimal alternatives taking into account the weight of various quality criteria was determined using the weighted intersection of fuzzy sets. The weight coefficients of criteria were determined based on calculated values of the right eigenvector matrix of pairwise comparisons with further multiplying by the number of criteria.

The calculation results of the weight coefficients of supplier's criteria are presented.

Keywords: supplier's criteria, criterion weight, alternatives, set membership function

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