MATHEMATICAL MODELING — APPLIED ASPECTS

PRACTICAL IMPLEMENTATION OF METHODS FOR OPTIMIZATION OF FLOW DISTRIBUTION IN WATER SUPPLY SYSTEMS

page 4–7

In this paper it is proposed to use the information on the actual flow rate in the water supply divisions for rapid determination of its hydraulic characteristics. The main aim of the research is to verify the adequacy of the mathematical model of flow distribution in real time, developing of recommendations on the use of information about the actual flow rates in divisions of network to optimize the flow distribution in it. The use of modern telecommunications allows dispatcher to collect and analyze information about the pressures in the network, which comes from sensors in its individual nodes.

In the paper it is shows that the results of the network calculation of one residential areas of Zaporozhye made taking into account the pressures measured in the control nodes, almost identical to the instrumental measurements.

The recommendations on the operational definition of the network hydraulic characteristics allow determining the damaged areas and making decision on the redistribution of flows.

The research results can be used in the design, reconstruction of existing water supply systems and to analyze the changes in the resistance of areas in time.

Keywords: flow distribution, mathematical model, control nodes, actual flow rates, pressure measurement.

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ONTOLOGICAL APPROACH AND FUZZY MODELING TO DESCRIBE OBJECTS OF LIVING ENVIRONMENT

page 7–9

The use of ontologies and mathematical approach using fuzzy models to describe the housing environment using modern information technology is considered in the article. The aim is developing the intelligent system that is designed to assess the quality of residential environment. The determined indices are depicted as ontological system represented using Protégé tool. The work result is developed ontological model of residential environment that can be used to assess the quality of apartments, houses, neighborhoods and districts. The use of modern information technology and the proposed intelligent system will simplify the work of real estate appraisers and consumers at flat choosing.

Keywords: housing environment, quality assessment, ontological model, fuzzy models, matrix knowledge.

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MECHANICAL ENGINEERING TECHNOLOGY

THE POSSIBILITY OF SOUND WAVE LOW-FREQUENCY RESONANCE FORMATION IN FLOAT GYROSCOPE

page 10–12

The subject of research is the two-stage float gyroscope, located in the acoustic field operational use of the aircraft.

The aim of the work is to analyze the beginning possibility of resonant type features under the influence of penetrating the external acoustic radiation in the gyroscope suspention.

The differential equations of thin shells to identify the transition conditions in the enclosure «acoustically transparent» structure are used for describe the dynamics of the body floating gyroscope.

It is established that at low frequencies, when the cutoff frequency is much smaller, is appeared the features of resonance type. The reason for the effect is the waves in the cylindrical body of the instrument. The effect of the acoustic transparency of the material body is appeared when the frame circumference track and circumference wave length track on a plane parallel to the front of the acoustic beam are corresponded. So, a sound wave passes into the device without dissipation of its energy, creating an increased energy activity of liquid and static component of the gyroscope suspension that leads to the emergence of Euler inertial forces in the float and the creation of an elastic-stress state of the material, perceived by gyroscope as «input» value.

The research results can be applied in rocket and space technology. The proposed schemes allow to establish the nature of occurrence of features in the gyroscope suspension at hypersonic motion, to analyze their appearance and choose the effective solutions to eliminate the influence of penetrating acoustic radiation at an additional error of board equipment on this basis.

Keywords: floating gyroscope, acoustic radiation, wave coincidence, low-frequency resonance.

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CORRECTION OF GYROSCOPES ERRORS IN OPERATING CONDITIONS BY VOLUMETRIC NONLINEARITY OF FLOAT SUSPENSION

This article examines the interaction of powerful shock acoustic wave with floating gyroscope suspension used in aerospace and aeronautical engineering. The main aim of the work is to assess the degree of influence of N-waves on the systematic component of the measurement error of the angular velocity. The usage of modern computer technology makes it possible to simulate the processes of interaction of acoustic fields with navigation devices without conducting of bench researches. The results for the angular velocity sensor, that series-produced by industry, are analyzed in this article. The results, obtained using the computer program, reproduce the seminatural bench test data with satisfactory accuracy. The transition from the classical to the convex circular cylinder suspension with non-zero Gaussian curvature is suggested to error reduce. Usage of the convex suspension does not significantly reduce the magnitude of the measurement errors but may be justified if necessary to increase the stiffness of the structure. The research results can be applied in the design and development of navigation equipment of aircraft.

Keywords: floating gyroscope, non-zero Gaussian curvature, convex suspension, N-wave.

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ANALYSIS OF DESTRUCTION CAUSES OF DRILL STRING ELEMENTS

The results of published material relating to failures of drill string are shown in the article. It is established that the accidents which occur with drill pipes usually has a fatigue character. The fatigue phenomenon is occurred at alternating bending, torsion collision, fluctuation of the drill string and variable loads. The main factor that causes variable strains and alternating bending is the rotation of the string. The highest percentage of destruction falls on drill pipe fracture in the thickened ends. The main loads occur in screw joints, so screw joint destruction are divided into two groups during exploitation: chipping of some turns and cone fracture of nipple or coupling. The results of this analysis can be used in developed of technical and technological measures to improve the resource and safe operation of the drill string.

Keywords: drill string elements, fatigue, fracture, accident analysis.

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IMPROVEMENT OF THE FEED SYSTEM OF THE COAL COMBINE BY MEANS OF LOAD FORECASTING

This article presents the consideration of the methods of increasing effectiveness of protection against overloads of electric drives and executive bodies of the booty combine with outrigger feed system. The main purpose of the study is validation the ways to improve efficiency protection against sudden overloads and improving the dynamic properties of the outrigger feed system. It is developed a computer simulation of transient processes in outrigger feed system and it is shown the process of formation of dynamic overloads on the executive bodies of the booty combine. It is justified ways of improving transient towards decrease dynamic overloads. For this purpose it is proposed the use of preliminary smooth decrease feed rate before the abrupt change of the mechanical properties of the mine for a period of 2 to 5 seconds. Further research may focus on the justification of the methods of analysis of the mechanical properties of the mine and the parameters of the system software load control combine with outrigger feed system.

Keywords: booty combine, outrigger feed system, overload, transient processes, speed, setpoint.

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INFORMATION TECHNOLOGY AND CONTROL SYSTEMS

INTEGRATED ASSESSMENT OF COMPUTER-BASED TESTING

This paper discusses the development and use of evaluation criterion of the test task in the use of e-learning and control systems by calculating a single evaluation index which helps to approximate evaluation of the test results to the criteria of effectiveness of open economic systems, formed naturally as a result of the operation of production systems and Queue systems.

This method includes the integration of all relevant factors of value of quality characteristics obtained in the educational process of knowledge and skills.

The presented method produces more accurate view about the skills obtained in training. This allows to display their real practical value in relation to the open economic system.

The results of investigations can be used in any area of the educational process, in particular during the computer-based testing.

Keywords: test evaluation, single estimate criteria, efficiency of problem solution.

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CLASSIFICATION OF UNCERTAINTIES IN THE MANAGEMENT OF ORGANIZATIONAL AND TECHNOLOGICAL OBJECTS

page 23–25

The classification of uncertainties on different grounds in the management of organizational and technological objects in different industries (food, chemical, oil refining) is discussed in the article and some results of our research in this area are given. The main aim of the study is the classification of uncertainty in the management of organizational and technological objects. Such industries as food, chemical, oil refining process are characterized by complexity, variability of performance indicators, high capitalization ratio, depending on the influence of environmental factors. This article discussed the various features of the emergence of uncertainties, which allows to classify uncertainty for further classification of risks in the management of organizational and technological objects. The presented classification of uncertainties allows to structure the possible risks in the management of complex organizational and technological objects in the current and strategic activities, as well as to identify possible methods of dealing with the risks and how to avoid them. Classification of uncertainty, suggested by the author, it is recommended for use in the development of expert systems for risk management of technological systems of continuous type, including businesses and corporations of sugar industry. The research results can be applied in decision support systems for the sugar industry.

Keywords: uncertainty, risk, classification, strategic management, decision-making.

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ANALYSIS AND MANAGEMENT ALGORITHM OF COMPLEX SECURITY BASED ON COGNITIVE MODELING

page 25–28

The features of information security system creation, taking into account the subjective side of the process are analyzed in the article. The main aim of research is algorithm developing of analysis and management of integrated security, which will unify approaches to information security management. Security does not exist in itself, apart from person. It provided for a person and it is estimated by person. Therefore, the concept of security is not only objective, but also subjective side, because of its evaluation is carried out in the end by person. Use of cognitive modeling can significantly improve the processes of analysis and safety management of information system. Benefits of cognitive approach is the possibility of semi-structured system modeling (bad formalized), which are characterized by incomplete or uncertain information about them. Algorithm application will allow experts in the field of information security begin to develop appropriate computational procedures and modules that can be further used in the construction of information security systems. Research results will be useful for services that deal with information security.

Keywords: information security, integrated security, cognitive modeling, information system.

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ALGORITHM ANALYSIS DEVELOPMENT OF HANDWRITING

page 28–31

Two algorithms that allow to recognize handwriting are shown in the article. These approaches are considered the most relevant off-line recognition, which is based on the handwriting recognition from scan image of profiles, agreements, statements and other documents. Development is done to promote recognition not only in document flow, but also in the field of artificial intelligence that surrounds subsequently able to analyze a human-written text. It was found that both the description algorithm can give us positive feedback for recognition. With the result of more than 90 % of the work on pattern recognition, at least one of the approaches will be fully achieved its investigation aim and will only improve the knowledge base, which is then able to provide for artificial intelligence an opportunity to learn through books and letters improving the percentage of recognition.

Keywords: handwriting, online method, offline method, handwriting recognition, IRC.

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THE EXPERIMENTAL EVALUATION OF THE STATISTICAL CHARACTERISTICS OF THE COMPRESSOR FRONT SUPPORT VIBRATION OF THE GAS COMPRESSOR UNITS

page 31–33

The use of statistical methods for the analysis of parameters is discussed in this article and an example of the results in our research is given. The main aim is to analyze the statistical characteristics of the signal, based on experimental data obtained at gas compressor unit № 9 of booster compressor station of underground gas storage «Bilche-Volytsya». An example of research of one informative parameter characterizing the operating mode of the compressor — the vibration displacement of front support compressor is given in the article. It is determined such signal characteristics as expectance, dispersion, histogram, empirical and theoretical density, distribution law, empirical and theoretical distribution function and other. This made it possible to prove the feasibility of lognormal distribution law using for this parameter and use it to solve problems of surge and anti-surge regulation protection.

Keywords: surge, vibration, statistical characteristics, distribution density, distribution law, distribution function.

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STRATEGIC PLANNING OF HOTEL AND RESTAURANT BUSINESS DEVELOPMENT

The possibility of long-term development of the hotel and restaurant industry is considered in the article. The purpose of research is the need to identify and address the reasons for the low competitiveness of the hotel and restaurant industry, consideration of the feasibility of its capacity planning and strategy development to achieve a leading position in the global market.

The theoretical research methods (methods of analogy and extrapolation, system analysis, forecasting and innovative development of innovative planning) are applied. It is determined the low competitiveness of the hotel and restaurant industry due to its direction of innovation at meet the actual demand in the market. Attention to the need to consider the latent needs of consumers, their ability to extensive and intensive development is marked. It is proposed to take into account the phenomenon of convergence for the conquest of the leading positions in the world market development of strategic planning of the hotel and restaurant industry. The research results can be used by researchers and practitioners in the hotel and restaurant industry. The introduction of strategic planning of the hotel and restaurant industry will provide an opportunity to take a leading position in the market.

Keywords: services, hotel and restaurant business, innovation activity, strategic planning.

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SYSTEM ANALYSIS METHODS' USAGE IN DEVELOPING OF INFORMATIONAL NETWORKS' USER MODEL

The model development of informational networks' user as bad formalized object using the methods of system analysis is presented in the article. The main aim of the study is to improve the efficiency and reliability of the simulation information networks by formalizing one of the most important input parameters — user model information networks. The complexity of the object (user) determines its versatility, implicit attitudes and relationships between its characteristics and the difficulty of determining of these parameters. Existing methods for the analysis of complex objects are useful for a particular subject area, but a similar method to the field of information networks are not yet offered, because the development of the model user of information networks is carried out using heuristic methods of system analysis of bad formalized objects. Using the methods of growing pyramidal networks and q-analysis allows determining the connection between the uncorrelated user characteristics and offering the classes of users based on the characteristics and needs of users. Informational networks' user model is offered using in the design of information systems, forecasting their growth, based on the changing values of the internal parameters and information networks' user needs.

Keywords: information networks, user, bad formalized objects, system analysis, pyramidal networks, q-analysis.

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MULTIPARAMETER CONTROLLER USAGE FOR GAS PUMPING UNIT CONTROL

Based on the experiment on a centrifugal supercharger Ц-6,3, which is included in anti-surge regulation of gas pumping units it is defined the productivity change of centrifugal supercharger

and changes in the degree of increase in gas pressure, from which is derived the transfer function of a centrifugal supercharger of gas compressor unit.

The method of parameter determining of regulator setting through such component of Matlab software as Check Step Response Characteristics block is given. The technological process simulation is conducted with PID, PIDD2-, PIDD2D3-, PDD2-, and PDPD controllers based on the determined values in Matlab software and their optimal settings are determined.

During research of system using multi controllers it is found that operation speed of system increases in comparing with PID-controller at: PIDD2 controllers to 4,44 %, PIDD2D3 controllers to 22,67 %, PDD2 controllers to 89,33 %, and PDPD controllers to 98,22 %.

Keywords: centrifugal supercharger, controller, settings, transfer function, operation speed, design, surge, control.

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EXTREME REGULATOR STRUCTURE GROUNDING OF AUTOMATED PROCESS PRODUCTIVITY OF ELECTRIC DISCHARGE MACHINING

The use of process productivity extreme regulator of dimensional arc processing in engineering is discussed in the article and some results of our research in this area are given. The main aim of the investigation is finding the output patterns of its functions on stabilized and unstabilized process segments of dimensional arc processing on proposed implementation of the regulator.

The use of modern control systems of electric discharge machining process allows processing the materials with higher energy efficiency and less resource consumption.

A variant of solving the problem of finding the productivity extremum of dimensional arc processing based on stochastic and different frequency disturbances is proposed in the article.

The presented implementation of extreme regulator allows automating the process of finding and maintaining the feed rate

of electrode-tool, at which the maximum process efficiency is obtained.

The research results can be used by designers, engaged in the field of process automation of electrode-tool advance during electric discharge machining of metals.

Keywords: extreme regulator, dimensional arc processing.

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INFORMATION SECURITY MANAGEMENT BASED ON INTELLIGENT TECHNOLOGIES

The analysis of information and telecommunication networks of new generation is shown in the article. It is proved that security in the ITN has significant differences from the security-specific information in any specified system. Creation of security in ITN, oriented to work with incomplete or fuzzy initial information, uncertainty of external influences and environmental

performance, requires the involvement of non-traditional approaches to safety management in ITN using methods and techniques of artificial intelligence. The aim of research was developing the scientific bases of situational safety management in ITN on the base of intelligent technologies. The generalized structure of intelligent security management is given. The structure of neural evaluation of the safety in ITN is presented and the principle of operation is described. The research results can be used by specialists in the field of security of information and telecommunication systems and networks. The developed basis of situational safety management in the ITN can be taken into account in the developing of advanced safety systems in ITN on the base of intelligent technologies.

Keywords: information and telecommunication network, intelligent technology, threats, neural network.

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