

Informatics, computer engineering and control

SOFTWARE THROUGH WORKFLOW PROCESS SYSTEMS MULTIVENDOR PRODUCT LIFECYCLE MANAGEMENT

A.V. Bredikhin, Ph.D., assistant professor of computer intelligent design technologies, Voronezh state technical university, Voronezh, Russian Federation, e-mail: bredihin_av@dmsolution.ru

S.L. Podvalny, Doctor of technical sciences, Full professor, Head of department, Voronezh state technical university, Voronezh, Russian Federation, e-mail: spodvalny@yandex.ru

Ju.M. Shkolnikova, postgraduate, Voronezh state technical university, Voronezh, Russian Federation, e-mail: chjulia@list.ru.

In article the problems of creation of the through automated workings processes are considered within the framework of the different informative systems. The single standard of description of workflow processes absents now, that complicates development of integration decisions between the different platforms systems. The production process of technical difficult wares foresees wide co-operation. At the use of cooperants of the different PLM systems workings processes have a point of break on a border to each of them. Existent programmatic integrations decide the question of communication of engineering's data, to the electronic technical document. Work examines questions of the creation of through WorkFlow process on the basis of the application of the size XML. Structure with the description of key data is proposed. Examples of the description of separate elements and form of the file of that describing XML, them are given. Is made conclusion about the need of creating the specification XML for the transmission of information about the business- processes within the framework of different information systems of the support of the life cycle of article, which in turn, will make it possible to perform the matched work and to make qualitative administrative decisions. Offered method of the informative providing of integration at level workflow will allow to pass to the high-quality new level of co-operation between enterprises, providing creations of through working development and production of good process

Key words: workflow, PLM, workflow automation

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RESEARCH OF DESIGN PROCESS SYNTHETIC IMAGE THE HIGHEST QUALITY ON THE BASIS OF SERIES OF SNAPSHOTS

O.A. Pakhomova, assistant, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: olesja555@list.ru

O.Ja. Kravets, doctor of Technical Sciences, Professor, Voronezh State Technical University, Voronezh,

Russian Federation, e-mail:csit@bk.ru

O.V. Avseeva, assistant professor of Technical Sciences, Voronezh State University of Engineering Technologies, Russian Federation, e-mail: olga-avseeva@mail.ru

The algorithm of obtaining the best frame from a series of consecutive shots of a dynamic object is defined which is the following is discusses some of the popular methods of segmentation, evaluation of image quality and zoom and, as a result, the construction of an artificial image based on the best segments.

Certain popular methods of segmentation, namely the methods of the watershed, edge detection and an original method of quantile. The advantages and disadvantages in the use of a particular method are identified. Some popular methods of segmentation, namely the methods of the watershed, edge detection and an original method of quantile are considered. Formulas allowing calculating the estimate of the image quality are detected. Advantages and disadvantages in the use of a particular method are identified. The assumption of a uniform velocity of the observed object was included in the consideration of the problem to allow holding the zoom process with maximum precision.

Thus, the formula for scaling images is detected. Conclusions about the possible difficulties of building a new image based on the selected segments are produced. The main problem in this case is the need to develop a new algorithm for image segmentation, which allows to combine the advantages of others, and to solve the problem of synthetic images

Key words: segmentation, image processing, quality assessment, synthetic image recognition

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THE ALGORITHM OF TERMINAL-OPTIMAL CONTROL OF AN UNMANNED AERIAL VEHICLE

N.Ya. Polovinchuk, Cand. Sc. (Tech), professor, professor of chair of the AERPO of the Rostov Branch of the Moscow state technical university of civil aircraft, Rostov-on-Don, Russian Federation, e-mail: doozy@yandex.ru

S.V. Ivanov, Cand.Tech.Sci., the senior lecturer of chair «Automation of productions» of the Don state technical university, Rostov-on-Don, Russian Federation, e-mail: sta399@yandex.ru

V.I. Timofeev, the senior lecturer of chair «Automation of productions» of the Don state technical university, Rostov-on-Don, Russian Federation, e-mail: yman9@rambler.ru

One of directions of perfection of control systems of highly maneuverable unmanned aerial vehicles is the formation control in the terminal phase of the trajectory. However, the accuracy of these algorithms traditionally used in control systems is reduced as a result of the perturbation of a high level. This is due to the inadequacy of the algorithms used in the forecasting models. In addition, their implementation is restricted to computing resources on-board electronic computers.

In the algorithms of terminal control associated with the prediction of the future movements are present iterative procedure that with the limited capability of on-board digital computing machines allows significantly increase the frequency of the circuit feedback loop. It is not possible to compensate for errors of multi-step management process, such as in cases of control spacecraft reusable or unmanned maneuvering aircraft.

Therefore, to improve the control accuracy in the forecasting algorithms, it is advisable to use the most adequate model of the controlled vehicle.

This paper describes the algorithm of terminal optimal control with forecasting the future movement of the aircraft, which distinguishes from the known fact that in the scheme of prediction uses the identified set of dimensions the model of controlled aircraft movement.

The effect of perturbations at different phases of flight at a high level, which are a priori uncertain require inclusion in the outline predict recognition algorithms.

This approach allows us to compensate for the limited computational power on-board electronic computers and to increase the precision landing of aircraft in a given terminal area.

Consider a practical example justifying the adequacy of the chosen mathematical model of the motion of the aircraft and the performance of the proposed algorithm with simulation results

Key words: motion prediction, unmanned aerial vehicle

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THE TASK OF CHOOSING BIT RATES OF MEDIA STREAMS

A.A. Rogov, Doctor of Technical Science, Professor, Petrozavodsk state university, Petrozavodsk, Russian Federation, e-mail: rogov@petsu.ru

R.V. Voronov, Ph.D, Associate professor, Petrozavodsk state university, Petrozavodsk, Russian Federation, e-mail: rvoronov@sampo.ru

E.A. Petrov, postgraduate, Petrozavodsk state university, Petrozavodsk, Russian Federation, e-mail: johnp@petsu.ru

Network impairments can affect media streams that are transmitted via Internet. These impairments can cause problems on the client side such as stopping media stream for buffering or long starting of media stream. Adaptive streaming strategies over HTTP help to avoid these problems. The source stream is encoded in different versions (representations) and then these representations are available for users. This approach allows clients to have an ability to select a video in the representation that best fits their needs. Creating a set of bit rates in real time is very resource-intensive process. Usually it is possible to generate a set of only 4-6 bit representations. There is a very difficult problem to properly select the representation set. In this paper, we provide an approach for optimizing the set of bit rates of a media stream. This approach takes into account the needs of customers watching this media stream at that moment. It helps to identify an optimal set of bit rates for a media stream which gives the best possible quality to a media stream within users' available Internet connection and reduces streaming delay to the minimum. The algorithm for solving the problem based on the dynamic programming method is presented in the paper. This approach was

tested in our testbed for a media stream transmitted by MPEG-DASH protocol. The test results showed that the presented approach may be used to solve problems described above

Key words: e-learning, bit rate, multimedia stream, MPEG-DASH

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CROSS-STRUCTURAL FUNCTION AND MODEL OF DYNAMIC FORECASTING FOR MATHEMATICAL EXPOSITION OF THE PROFILE IRREGULARITIES OF PRODUCTS

E.A. Gantseva, Candidate of Technical Sciences, Docent, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: caladze@yandex.ru

V.A. Kaladze, Doctor of Technical Sciences, Professor, The International Institute of Computers Technology, Voronezh, Russian Federation, e-mail: wakaladze@yandex.ru

V.N. Shaposhnikov, Candidate of Technical Sciences, the General Director, OAO «AGROELEKTROMASH», Voronezh State Technical University, Voronezh, Russian Federation, e-mail: aem142@yandex.ru

In paper problems of statistical calculation of values of GOST's performances of surfaces of products are solved. Outcomes are used for control of machine tools with computer numerical control (CNC). For this purpose data about a grain of a surface imperfections of a product are considered in the form of casual numerical temporary sequence, as realisations of nonstationary casual process. For a substantiation of a possibility of statistical exposition are used function cross-structural. Data processing is to fulfil with use dynamic predictors models of casual processes.

The received algorithmic model is developed for use in an operational control on machine tools with updating of quality of a product. According to actual square of contact to an edge of the cutting tool it is possible to make a solution on level of deterioration and cutter replacement. It will allow to lower number of the rejected products considerably. Outcomes of research are included in soft a tokarno-milling treating site of the customer with machine tools CNC for contour milling of complicated details under the form with high requirements to cleanliness of handling of a surface.

The offered approach to creation by a control system by park of machine tools is universal. It can be applied to control of modern industrial robots.

A use function cross-structural and dynamic model of nonstationary casual processes defines scientific novelty of researches. The process engineering developed on their basis have the practical importance

Key words: a irregularities profile, function cross-structural, dynamic predictor model

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Energetics

CREATING A PARAMETRIC OPTIMIZATION MATHEMATICAL MODEL OF PUMP IMPELLER WITH HELP OF ANSYS WORKBENCH

Yu.A. Bulygin, Doctor of Science (Engineering), professor of Oil and Gas Equipment and Transportation Department of Voronezh State Technical University, full professor, Russian Federation, E-mail: bulyginu@gmail.com.

A.V. Ivanov, Doctor of Science (Engineering), Professor of Rocket Department of Voronezh State Technical University, associate professor, Russian Federation, E-mail: Iav308@inbox.ru

D.N. Galdin, postgraduate student at the Oil and Gas Equipment and Transportation Department of Voronezh State Technical University, Russian Federation, E-mail: dmgaldin@yandex.ru.

The article describes in detail the staged development of the parametric optimization model of the centrifugal pump in ANSYS Design Modeler module. In the considered model uses the morphological type of transformation geometry, using functional dependencies between the individual elements. In the described model uses a large number of parameters, which, if necessary, you can limit. The main tasks solved with the help of the constructed models are improving the accuracy, reducing the complexity and duration of calculation, elimination of the influence of "human factor". Developed a parameterized model can be applied to optimize centrifugal pumping units, which uses an impeller with cylindrical shape of the blade

Key words: centrifugal pump, impeller, ANSYS, hydrodynamic processes

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SYNTHESIS OF OPTIMAL STRUCTURE OF THE ENERGY SYSTEM LONG-TERM HYDRAULIC SYSTEMS

S.I. Zolotukhin, graduated, Military educational and scientific center of the Air Force Academy named after Professor N.E. Zhukovsky and Y.A. Gagarin, Voronezh, Russian Federation, e-mail: vaiu@mil.ru

Development of complex technical system at the moment can not do without solving various optimization problems. The dimension that with the growth of computing power and is constantly increasing. This article focuses on the synthesis of the optimal structure of the energy system perspective hydraulic system for maintenance fifth-generation aircraft. Increasing their maneuvering capabilities inevitably leads to an increase in working pressure in the hydraulic drive. Saving resource aircraft carried out by mining its hydraulic system ground hydraulic unit. In this connection the question of synthesis of the optimal structure of the energy system perspective the hydraulic system is important.

The author of the article for the first time applies a differentiated scale of relative importance in the complex transposition of matrices to obtain the correct display of local alternatives to priority vectors, and additionally introduces reliability index to improve the accuracy of local priority vectors expert evaluations. The introduction of the relative importance of scale reduces the differentiated elements of subjectivity arising from expert evaluations, and the transposition of matrices allows modification of the method developed by the author to solve the complex task of maximizing performance and minimizing alternatives under the relevant criteria. Before the optimization necessary to form a group of possible options for alternative structures. To solve this problem we have been applied elements of probability theory, namely the combination in combinations.

The result is a rational structure of the hydraulic system according to an embodiment with an electric motor and the power supply of 380 V. In general, in this article solved an important problem of structural synthesis, laid the foundations for the study of development prospects

Key words: optimization, energy system, differential scale of relative importance

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THE POSSIBILITY OF USING THYRISTOR SWITCHED CAPACITOR IN AUTOMATED CONTROL SYSTEM OF POWER GRID OF INDUSTRIAL ENTERPRISES FOR COMPENSATING REACTIVE POWER

V.N. Krysanov, Candidate of Technical Sciences, assistant professor, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: sovteh2000@mail.ru

K.V. Ivanov, graduate, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: Dharma_lost@bk.ru

The article considers typical industry consumers of reactive power as a part of industrial enterprises, given their daily load curves in accordance with the production process. Functionally describes an automated control system of power grid, describes the criteria for adaptation of reactive power compensation devices (capacitor banks) in the adapted to automated control system of power grid. In accordance with the task of adaptation the problems of capacitor banks switching elements raised. It analysis connectivity options of capacitor banks to the power grid and offers an alternative. It gives calculation of nominal current of static capacitor bank and determination of the number of commutations in accordance with the standard load curve. According to the calculated value of the rated current selection of necessary to a capacitor bank power components is made of the modern semiconductor components. In conclusion compiled a comparative table of price performance and service life of the previously chosen equipment. In accordance with a specific value of 1 kVAr calculated economic benefit from the use of different ways to connect the capacitor bank. A comparison in which it is established that the best way to the criterion of "price-quality-reliability" is the use of thyristor group short-term overload conditions, together with a solid state relay

Key words: compensating reactive power, thyristor switched capacitor

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EVALUATION OF TEMPERATURE POLYMERFINISHING MATERIALS DURING FIRE

A.M. Chuikov, Candidate of Technical Sciences, Head of the department of chemistry and combustion processes, Voronezh Institute of Russian Ministry for Emergency Situations, Voronezh, Russian Federation, e-mail: hipg_vigps@mail.ru

A.V. Zhuchkov, Doctor of Technical Science, professor Department of chemistry and combustion processes, Voronezh Institute of Russian Ministry for Emergency Situations, Voronezh, Russian Federation, e-mail: 79081407661@yandex.ru

A.V. Meshcheryakov, Candidate of Technical Sciences, assistant professor Department of chemistry and combustion processes, Voronezh Institute of Russian Ministry for Emergency Situations, Voronezh, Russian Federation, e-mail: Malviktp@gmail.com

V.I. Lukyanenko, Candidate of Technical Sciences, assistant professor Department of Theoretical and industrial power system, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: lukyanenko1@yandex.ru

A.V. Barakov, Doctor of Technical Sciences, Professor, Head of the Department of Theoretical and industrial power system, Voronezh State Technical University, Voronezh, Russian Federation

Discussed the use of polymeric materials in a modern town planning, the potential risks of heating and ignition of polymers in fires. Considered in the heat transfer process polymeric material based on the volume and nature of selective absorption of radiation heat flow during the fire. Noted dependence of the basic thermal characteristics - specific heat, thermal conductivity, density - temperature. Treatment of experimentally obtained polyethylene emission spectra obtained by approximating analytical dependence of the total reflectance and absorption of the wavelength. An expression for the volume of the heat source.

On the basis of experimental data for the absorption spectra obtained an expression for the source term in the differential equation of heat conduction due to the radiant heat flow. We discussed the possibility of a numerical solution of the heat equation for polymer material, heated by radiant heat flow

Key words: fire, heat, polymer films, selective

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INFLUENCE OF GEOMETRICAL CHARACTERISTICS OF THE PIPE BUNCH ON KEY PARAMETERS OF AIR-COOLED HEAT EXCHANGERS TAKING INTO ACCOUNT THE NON-STATIONARY MODES OF THEIR WORK

S.V. Dakhin, Candidate of Technical Sciences, associate Professor, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: svdakhin@ya.ru

I.G. Drozdov, Doctor of Technical Sciences, Professor, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: drozdov_ig@mail.ru

V.I. Ryazhskikh, Doctor of Technical Sciences, Professor, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: ryazhskih_vi@mail.ru

Influence of geometrical characteristics of a finned surface of heat exchange tubes in low-line pipe bunches on the main characteristics of air-cooled heat exchangers is considered. For this purpose the mathematical model where crushing of a surface of heat exchange on the course of the heating heat carrier is carried out on is offered n elements, equal on length, which on the course of air are limited to a half of distance between the next cross ranks of tubes. Thus are allocated $n \times m$ settlement volumes, in everyone the "ideal replacement-ideal hashing" model which, within model with the concentrated parameters is realized, reduced to a problem of distribution of settlement volumes of elementary thermal streams. The offered approach allows to define directly a temperature pressure between heat carriers without attraction of additional functions, to define precisely which for difficult schemes of a current is rather problematic, to model operation of the heat exchanger with the result similar to result of numerical integration of the differential equations of a heat transfer and thermal balance, but without attraction of special means or packages of programming that accelerates and reduces the price of process and to model various schemes of a current of heat carriers at a minimum of iterative procedures.

Results of modeling showed that the most significant effect on the thermal power of the device is had edge height, material of a surface of heat exchange and outer diameter of a heat exchange tube, and the step and thickness of an edge, cross and diagonal steps of a pipe bunch have smaller influence.

For modeling of operation of the heat exchanger on the non-stationary modes the analytical expression allowing to estimate time of an exit to the stationary mode depending on conditions of heat exchange, geometrical characteristics and material of a heat exchange surface is received. The dimensionless type of the taught expression is universal, i.e. allows to receive decisions for any types of heat exchange devices without any restrictions.

The possibility of an intensification of a thermolysis from an edge which leads up to 40% to reduction of mass of the device that leads to reduction of dimensions of the device and time of an exit to a stationary operating mode is shown. At the same time, because of a low-lane of a pipe bunch, growth of hydrodynamic resistance does not lead to noticeable increase in required power at pumping of the heat carrier

Key words: edges, non-stationary mode, holes, intensification

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SIMULATION OF HEAT TRANSFER IN THE SERIES HEATING AND COOLING

V.M. Zarochentsev, associate professor of the North Caucasian mining and metallurgical institute, Russian Federation, e-mail: vlazarm@gmail.com

T.V. Kondratenko associate professor of the North Caucasian mining and metallurgical institute, Russian Federation, e-mail: starikova.tatiana2012@yandex.ru

A.K. Makoeva, graduate student of the North Caucasian mining and metallurgical institute, Vladikavkaz, Russian Federation, e-mail: makoeva_alla@mail.ru

The purpose of the submitted article the mathematical model is development of allowing investigating the dynamic processes of heating and cooling of the large block under the heat fluxes free distribution.

The physical analog offered earlier consists of a large block, a heating element and a fan which allows to define heat fluxes in the steady-state conditions. The solution of heat fluxes indexes definition problem in such conditions demands development of the generalized model on the basis of the experimental data. At the same time, the model must be rather flexible to adapt it to the various operating conditions of installation. The basis for creation of such a model is the system of the mathematical equations describing heat streams.

Proceeding from the received equations, it is possible to create algorithmic model by means of the "Simulink" system, which consists of a combination of the blocks connected with each other with "rubber" lines: the blocks setting initial parameters and boundary conditions; the block - derivation solving the constitutive differential equations; blocks - display of information in the graphic and numerical presentation, blocks - switches allowing changing the model duty to "heating" or "cooling" and arithmetic blocks for the equations solution. Then the model research resulted in the schedules of transition phenomenon displaying temperature change of the large block in time and heat rate change of the large block was conducted. The analysis of the received schedules showed that the heating rate changes rapidly in a short time from 300 to 500 c.

The work results can be used during the research process and projection of heat power devices and processes

Key words: mathematical modeling, heat transfer, heating and cooling

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RESEARCH AND PREDICTION OF THERMAL GAS PARAMETERS

FLOW COMBUSTION CHAMBERS OF AVIATION GTE

A.E. Kishalov, Candidate of Technical Sciences, associate Professor, Ufa State Aviation Technical University, Ufa, Russian Federation, mail: kishalov@ufanet.ru

K.V. Markina, assistant, Ufa State Aviation Technical University, Ufa, Russian Federation, e-mail: markina_kseniya@mail.ru

The article investigates the changes of gas-dynamic parameters at the inlet and outlet of the main combustion chamber and afterburner aircraft gas turbine engines various schemes depending on the year of their development. These parameters allow assess the dimensions of the combustion chambers, the degree of their perfection, to analyze the parameters of the combustion process (the processes of preparing the fuel-air mixture, flame stabilization and combustion processes).

Were analyzed more than 100 aircraft gas turbine engines native and foreign production of various types of schemes and principles of action from 1948 to the present time (turbojet engine, afterburning turbojet engine, afterburning turbofan engine). Compiling them thermal-gas model simulation system DVIGw, are defined the missing parameters.

A result of research are defined the main parameters approximate depending on the input and output of the combustion chambers, depending on the engine, the design, which allows to predict parameters for combustion chambers for perspective products.

Such research will allow to specify applicable in serial and pilot production mathematical models of combustion chambers and the engine as a whole, which will accelerate the development cycle of new aircraft of civil and military purposes, reduce the amount of experimental and finishing research, will enhance the operational efficiency of the designed technology

Key words: thermal gas modeling, aviation gas turbine engines, combustion, combustion chamber, main parameters and characteristics

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Radio engineering and communication

USE FORCED TO REDUCE THE CONVERGENCE COMPLEXITY LDPC DECODING

A.V. Bashkirov, Ph.D., assistant professor of design and manufacture of radio, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: kipr@vorstu.ru

M.V. Horoshaylova, postgraduate of design and manufacture of radio, Voronezh State Technical University, Voronezh, Russian Federation, pmv2205@mail.ru

In this article, we show the architecture of the decoding on the basis of codes with low-density parity-check that utilizes threshold rule to decide whether the variable node LDPC decoder to update its information in subsequent iterations of the decoding process, or be regarded as convergent-superconductivity (convergence). It is shown that when choosing the threshold accordingly, decoding complexity can be significantly reduced with only a slight deterioration of correction performance on the other side. There is introduced a method of "Forced convergence" (FC), to reduce the number of active sites per iteration, which in turn, reduces the overall complexity of decoding. A new architecture of LDPC decoder, coined approach "forced convergence". Talking about the concept that a large number of nodes converges very quickly during the transmission of messages using the threshold rule for the identification of sites that already have a strong "confidence" in their probability of being in state 0 or 1. These nodes are disabled and their corresponding messages are no longer updated - which reduces the complexity of decoding. The results show that the forced convergence is a powerful tool for reducing the computational complexity of LDPC decoding

Key words: high throughput, the LDPC decoder, low-complexity algorithm for message transmission

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VERIFICATION LDPC OF CODES

N.V. Astahov, Ph.D., assistant professor of design and manufacture of radio, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: kipr@vorstu.ru

A.V. Bashkirov, Ph.D., assistant professor of design and manufacture of radio, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: kipr@vorstu.ru

A.S. Kostyukov, student of design and manufacture of radio, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: stalkerklon@mai.ru

M.V. Horoshaylova, graduate student of design and manufacture of radio, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: kipr@vorstu.ru

O.N. Chirkov, senior Lecturer of design and manufacture of radio, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: kipr@vorstu.ru

This article presents a comparative analysis of LDPC codes with codes such as the turbo codes, Reed-Solomon codes, etc., are provided both advantages and disadvantages compared to the LDPC codes over the listed codes. As comparative data

shows simulation graphics data codes. As a comparative simulation was made LDPC codes and Reed-Solomon codes. Construction of these codes are either cyclic or quasi-cyclic, thanks to this feature you can not just make a quick decoding of information, but also to accelerate data encryption. Established that LDPC codes exhibit poor performance by taking into account a coding rate, this is due to the fact that Gallager codes, having distinct coding rate, can not be free from the standpoint of the codes given speed. The investigation results are best decoding algorithms that work with unquantized demodulator solutions. The possibility of using the LDPC codes in different standards of coding information, such as DVB - S2, DVB - T2 and IEEE 802.3an, and also considers the development of LDPC codes, their prospects for future use in a variety of ways to encode data

Key words: LDPC codes, a turbo codes, Read Solomon codes, standards of coding of information of DVB – S2, DVB – T2 and IEEE 802.3an

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INVERSION OF THE MAJORITY MULTIPLEXER

S.F. Tyurin, Honored Inventor of the Russian Federation, Doctor of Technical Sciences, Professor at the Department of Automation and Telemechanics Perm National Research Polytechnic University, Russia, 614990, Perm, Komsomolsky Av., 29, e-mail: tyurinsergfeoyandex.ru

Creating a fault-tolerant onboard digital computer systems is one of the urgent tasks, particularly in the light of recent developments in the field of import of electronic components. One of the main ways to increase the reliability in this area was and still is the structural redundancy. Used triple redundancy with a choice of channels by a majority vote (for example, "two of three", "three out of five," etc.). Using the majority multiplexers allows not only to carry out the choice by a majority vote, but also to check the performance of each individual channel. In the paper, CMOS Majority Multiplexer circuit is constructed by analyzing the inversion of the truth table

Key words: Fault-Tolerant Digital Computer, Majority Multiplexer, Inversion

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THE ANALYSIS OF RADIATION PATTERN OF CIRCULAR ANTENNA ARRAY TAKING INTO ACCOUNT QUANTITY OF ELEMENTS AND INFLUENCE OF THE CARRIER

L.A. Nosova, student, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: liy1994@mail.ru

Yu.G. Pasternak, Doctor of Technical Sciences, Professor, Professor of department of electronic devices and systems, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: pasternakug@mail.ru

A.S. Samodurov, Candidate of Technical Sciences, Associate professor, Assistant professor of department of design and manufacture of radio, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: unaxel2000@mail.ru

For different purposes can be used arrays built for a variety of geometric principles and composed of different elements. In this paper we analyzed the radiation pattern direction-finding antenna array consisting of three and nine vertical half-wave dipoles. The radiation patterns are the reciprocal correlation functions of ideal and real bearings. Formulas for calculation of these functions are given. The antenna array is located on board the unmanned aerial vehicle (quadrocopter). It determines the influence of the media on the grid characteristics, in particular in the radiation pattern. The numerical simulations show a strong dependence of the shape of the number of array elements and a particularly strong influence of the carrier apparatus at high frequency operating range at specific angles of arrival of the electromagnetic wave. For a three-element array identify large levels of rear and side lobes on all analyzed frequencies other than the lowest 450 MHz. Impact carrier is most noticeable at the highest frequency of 1800 MHz with an angle of arrival of a wave of 90 °

Key words: radiation pattern, antenna array, quadrocopter

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MORPHOLOGY ALUMINUM METALLIZATION ON THE FPGA CHIP CONTACT PADS

E.V. Goncharenko, post-graduate, Voronezh State University, Voronezh, Russian Federation, e-mail: zews-00@mail.ru

T.G. Menshikova, Candidate of Physico-Mathematical Sciences, Associate Professor, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: menshikova.vrn@mail.ru

M.V. Grechkina, engineer of the center for collective use of scientific equipment, Voronezh State University, Voronezh, Russian Federation, e-mail: grechkina_m@mail.ru

E.N. Bormontov, Doctor of Physico-Mathematical Sciences, Professor, Voronezh State University, Voronezh, Russian Federation, e-mail: me144@phys.vsu.ru

The reliability of semiconductor devices is concerned with the production technology, especially with contact connections operations. One of the most common causes of failures, related to the process of producing, is a damage of the crystal and case microjoints and inner connectors with contact pads of crystal and case. According to native and foreign literature from 35 to 60% of all failures in electronic devices caused by mikrojoints.

Physics mechanical properties of the platforms material affect on the reliability of connections. For example, acoustic conditions at the USW zone depend on morphology of contact platforms covering. In order to form strong and reliable microjoint is necessary to have contact platforms covering with small height of microroughnesses and, whenever possible, smaller value of internal tension.

The Influence of a condition of FPGA crystal contact platforms metallization on quality of a weld seam was studied. The morphology of a surface of aluminum metallization was studied using atomic-force microscopy (AFM) in the semi-contact mode. Chemical composition data were obtained by scanning electron microscope (SEM) method. Visual check was performed using Jenatech optical microscope with increase 1000x

Key words: aluminum metallization, programmable logic integrated circuits (FPGAs) pad

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REFLEXIVE ANALYSIS OF OPPORTUNITIES AND MAIN CONSTRUCTIVE AND TECHNICAL CHARACTERISTICS OF ANTENNAS OF DIFFRACTION RADIATION ON THE BASIS OF THE PERIODIC SLOWING DOWN STRUCTURES

D.Yu. Kryukov, Postgraduate, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: kryukovdy@bk.ru

A.V. Ostankov, Doctor of Technical Sciences, Associate Professor, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: avostankov@mail.ru

A review of the most famous and widely used types of antennas diffraction radiation, including a detailed description of electrodynamic characteristics of their functioning. In these antenna systems use a phenomenon of transformation of surface electromagnetic waves in a volume on periodic in homogeneities. For most of the described antenna are the basic structural and electrical parameters. It is found that the diffraction leaky wave antenna through the radiating transmission lines have a relatively high efficiency and small dimensions and weight characteristics. Another important advantage of the diffraction radiation of antennas is their mechanical and dielectric strength, which allows them to find use in radio systems operating in the complex mechanical and climatic conditions. Possible future directions for further improvement and modernization of the diffraction radiation antennas

Key words: antenna, periodic array, superficial wave, diffraction radiation

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LYAPUNOV'S PROBLEM CONFORMABLY TO TIME VARYING CIRCUIT WITH PERIODICAL PARAMETERS

N.D. Birjuk, Doctor of Physico-mathematical Sciences, Professor, Voronezh State University, Voronezh, Russian Federation, e-mail: lidia@vmail.ru

A.Yu. Krivtsov, engineer, JSC "Concern "Sozvezdie", graduate, Voronezh State University, Voronezh, Russian Federation, e-mail: ukroorg@rambler.ru

In general use methods of analysis of electrical and radio circuits stability (of Routh-Gurwits, Mikhaylov, Naykwist) do not include circuits with evidently dependent in on time parameters (time varying circuits). In that cases it is expediently to use Lyapunov's theory of stability, which for unknown reason did not proper dissemination in radio engineering. Time varying circuit the most uses in practice among other time varying circuits. Analysis its stability is complicated theoretical problem. Its mathematical basis are relatively little known Lyapunov's publications dedicated to special stability problem of truncated linear differential equation of the second order with periodical coefficients.

Below it is proposed on this basis method of analysis of particular, but characteristic case of time varying circuit. The method may be generalized to more complicated time varying circuits. In general use similar problems are bound up with unwieldy transformers. In this time it may be accomplished with the help of computer. Stability analysis of the real physical objects allows to attract physical sense and to overcome some difficulties of analysis of abstract mathematical equations

Key words: time varying circuit with periodical parameters, stability about Lyapunov, Lyapunov's constant, reduction of time varying circuit stability problem to Lyapunov's problem

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Mechanical engineering and science of machines

PARAMETERS OF TREATMENT PROCESS BY WIRE ELECTRODE TAKING INTO ACCOUNT SELF-VIBRATION OF TOOL

V.V. Zolotarev, postgraduate, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: Z.V.V.220975@mail.ru

V.P. Smolentsev, Doctor of Technical Science, Professor, Voronezh State Technical University, Voronezh, Russian Federation, e-mail: vsmolen@inbox.ru.

Researches for increase thickness of details cut by wire electrode on electro erosion equipment and machines for combined treatment are given in the article. Regularities of formation mechanism of wire in slot low-frequency self-vibration are identified for this. Conditions, at which movements of tool can be limited and completely excluded, are showed. Complex problem for creating new (at the level of invention) method of movement process stabilization of wire electrode in long length slot is solved. Development of equipment and technology, based on new methods and devices, protected by protection documents, is important now. It was necessary to create calculation procedure of process parameters taking into account self-vibration of tool for realization of created method. Limits through thickness of machined area of detail, where process stabilization can be achieved by tension of wire electrode and increase speed of wire-winding, are scientifically based and determined. However, this decision allows cover just a part of component spectrum, where treatment process by wire electrode has advantages. Given materials allows form the base for increase field of use of new technological processes in machine building and provide competitive ability of technical equipment in this field for electrical method of treatment

Given materials used for creation of perspective items in aerospace field, where electrical methods of treatment are more currently important and open possibility to design of perspective scientific products manufacturing of which are not possible by traditional methods and economically not effective. Also given results develop manufacturing technology of unique basic components and parts in different fields of machine building

Key words: wire electrode, self-vibration, product thickness, stabilization, process parameters

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