CURRENT TENDENCIES OF INTELLECTUALIZATION OF MANAGEMENT PROCESS IN HIERARCHICAL SYSTEMS IN THREATS

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Research Methodology. The methodological basis of the study comprises M. Mesarovich theory, the system analysis, methods of mathematical logic, the theory of decision-making in hierarchical complex-structured systems, the theory of conflicts and risks, the theory of intelligent systems.

Results. The article analyzes the main aspects of hierarchical systems functioning under conditions of risk and conflict, the methods of information technology have been used to study the intellectualization processes of complex objects management with a hierarchical aggregated structure. The block diagram of the hierarchical control system and the method for detecting clusters of inter-level conflicts have been developed.

Novelty. Scientific novelty of the results is that we have processed and classified the ways to prevent conflicts between levels of management hierarchy, as well as analyzed the risks. To develop intelligent concepts of coordinating hierarchical systems management with aggregated objects, we have used the methods of system analysis and the theory of hierarchical systems. A method for identifying active sources of resource and information impact on the system functioning and the formation of clusters of inter-level conflicts has been developed. The conditions of emergency risks in modes of limited load of units have been studied. It has been shown that the intellectualization of the selecting system of data flows and management reduces the risk of accidents and increases the stability of the hierarchical system by selecting the methods of construction of coordination strategies.

Practical Significance. To ensure the trouble-free operation of units of complex energy active systems, we have formulated the concept and developed the structural system of management intellectualization and coordination of all levels of the hierarchy, which reduces the level of conflict.

STABILIZATION OF TAPE TENSION IN TAPE-FEEDING AREA OF A SHEET-FED ROTARY PRESS WITH THE HELP OF A FLOATING ROLLER WITH PNEUMATIC CYLINDER

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Research Methodology. To achieve the assigned objectives in the article, we have used the basic statements and methods of the theory of control systems, the theory of discrete control systems, mathematical and computer simulation modeling

methods. We have used Matlab Simulink software package for a computer structural simulation of element models and sheet-fed rotary press systems, processing and obtaining characteristic dependencies.

Results. A discrete model of a tape feeding system in a sheet-fed press equipped with a floating roller and a pneumatic cylinder has been developed based on which an appropriate simulator has been built in Matlab Simulink environment. A computer simulation has been provided and transition processes of tape tension changes at maximum and minimum roll radius at the maximum and minimum machine operating speeds have been obtained. The results of the computer simulation of a tape feeding system with a floating roller and a pneumatic cylinder confirm its efficiency by significant reducing the tape tension force amplitude.

Novelty. A discrete model of a tape feeding system in a sheet-fed press equipped with a floating roller and a pneumatic cylinder has been designed that reproduces the dynamics of the processes occurring in a tape feeding system.

Practical Significance. Based on the proposed discrete model we can built simulators of tape feeding systems in web-fed presses equipped with a floating roller and a pneumatic cylinder which makes it possible to provide the simulations and studying the processes of tape tension change and pressure fluctuations in pneumatic cylinder chambers. On the basis of the developed model, the synthesis of tape tension and pneumatic cylinder chambers pressure regulators can be performed and digital automatic control system can be created.

ADAPTATION OF DIGITAL REGULATORS PARAMETERS TO CHANGES OF MAIN COORDINATES OF WINDING UNITS IN WEB ROTARY PRESSES WITH AC ELECTRIC DRIVES

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Research Methodology. The methodological basis of the research is made by methods of the theory of control systems, the theory of subordinate regulation, sensitivity analysis and digital structural modelling.

Results. The article presents the processed block diagram of a digital control system with frequency-controlled electric winding units of web rotary presses. The influence of destabilizing factors (fluctuations of voltage and power frequency current power converters, changing the heating temperature of machines, changing radii and moments of reels inertia and instability of engine parameters) on the precision of moving speed and tension bands adjustment of printed and unprinted material in winding mechanisms of web presses has been analysed. To compensate for these factors, the method of parameters adaptation and the operation of the laws regulators of digital control systems by winding units has been developed.

ABSTRACTS

Novelty. Scientific novelty of the results is that we have obtained the expression to adapt the parameters of regulators of digital control systems, depending on the speed of web rotary presses, the width and thickness of the bands, the motion mode of winding units (refilling, winding) and changes in moment of inertia and radii of reels and the instability of engine parameters.

Practical Significance. The obtained results can be used in the improvement of existing control systems of winding nodes of web rotary presses and in developing new high-performance printing equipment.

MODERNIZATION OF PROGRAM CONTROL SYSTEM OF SEWING MACHINE BNSH-6A BASED ON PROGRAMMABLE LOGIC CONTROLLERS

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Research Methodology. It is experimental at the development and research of a physical model of a system of program control (SPC), the use of its simulation work on the computer Editor FBD (Functional Block Diagram) program using LOGO! Soft Somfort, mathematical modelling.

Results. We have developed a laboratory sample of SPC of sewing machines of domestic production of the model BNSH-6A based on the use of programmable logic controllers, mass-produced and are consistent with the achieved level of scientific and technological developments and a modernized control unit of block matching accuracy of sentences in the block.

Novelty. It deals with general issues of designing of SPC of sewing machines based on programmable logic controllers, providing sewing a book block and produces and gives commands to trigger actuators in accordance with the process of sewing books and measures the speed of the machine and the feeding rate of blocks on the swinging table.

Practical Significance. The use of SPC at sewing machines improves its performance by reducing support time, increases the accuracy and correctness of picking up book blocks, reduces the impact of errors on the quality of an operator's work and reduce his fatigue, raise the production culture. The results can be implemented in the Kiev Factory of Printing Presses to upgrade the existing presses and in the educational process in the development of scientific and technical support for the regional cluster "Publishing and Printing".

DETERMINATION OF COVERING OF TEN-RANGE SCALE BY INK IN AN INKING SYSTEM OF CONSECUTIVE STRUCTURE

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Research Methodology. The methodological basis of the research is the equation of material balance of ink flows in the printing system. To solve this problem, we have applied the theory of signals to analyse ink flows modulated by a raster printing plate, graphs to describe the modulated ink flows, the simulation for calculation and building the characteristics of the coating.

Results. The study has elaborated a mathematical model of transferring ink flows modulated by a raster printing plate which describes the covering of ten-range scale by ink. We have constructed a graph of ink printing system on basis of which we have processed a block diagram of a simulation model in Simulink. The results of simulation modelling have been presented as an ink covering characteristics of ten-range scale for an anilox roller of different capacity. It has been established that the error of coating the scale by ink does not depend on the capacity of an anilox roller and is within + 8.64% on light areas to -16.62% in the shadows, which does not fully provide technical requirements for the precision of ink coating on the whole range of tone reproduction. The work has practical value.

Novelty. Scientific novelty of the results is the fact that the first mathematical model of ten-range scale ink covering has been designed in flexographic printing system of consecutive structure describing the dependence of the ink thickness on the tone reproduction range which is the basis for the analysis of the properties of the system.

Practical Significance. It has been found out that the thickness of the ink does not fully ensure regulatory requirements for the precision of ink covering of imprints. Results of the study can serve to organize tone reproduction, combination of intervals of the original density with the density of raster imprint.

ANALYSIS OF VALUES ORDERING
IN THE FORMULA OF MATHEMATICAL INDUCTION

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Research Methodology. The methodological basis of the research is the mathematical logic, the mathematical induction method and the analysis method.

Results. The analysis of the known mathematical induction formula has established the need for ordering of linked variable values. It has been shown that the means of algebra of algorithms provide an analytical description of variable values. The axiom of mathematical induction has been built as a formula of algebra of algorithms. It has been established that the obtained axiom of mathematical induction as a formula of algebra of algorithms is identically true.

Novelty. Scientific novelty of the results is to describe the mathematical induction as a formula of algebra of algorithms. The identical truth of the received formula of algebra of algorithms, which expresses analytically the ordering of variable values has been established.

Practical Significance. The formula of mathematical induction can be used to prove mathematical statements as well as for the verification of mathematical and software support of computer systems.

LIGHTWEIGHT ENCRYPTION FOR SYSTEMS WITH LIMITED RESOURCES

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Research Methodology. The main efficiency statements of lightweight cryptography, techniques of modern and classical encryption algorithms, methods of expert estimates have been used in the work.

Results. The paper presents a comparison of block symmetric algorithms AES, CAST5, Camelia, MARS and Serpent on the criteria of performance / memory in the implementation of 8-bit microcontrollers available with the AVR architecture in the language C.

Novelty. The efficiency of symmetric algorithms of lightweight cryptography has been shown. An anticollision protocol has been created based on the structural features of the data packets of cards EM4100.

Practical Significance. The results of these studies confirm the perspective and feasibility of lightweight cryptography in passive RFID-labels to protect the data during the transmission over the channel "label-receiver." The discussed algorithm optimizations in the implementation of 8-bit embedded platforms allow you to reach a compromise between the parameters of price / power consumption depending.

METHODS OF IDENTIFICATION AND DETECTION OF ATTACKS ON LABELS PRODUCTS

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Research Methodology. The methodological basis of the conducted in the paper research of possible attacks on the label products is the methods of mathematical logic; the determination of interconnections of detected attacks with the values of safety and security measures – methods of semantic analysis.

Results. The study has analysed the attacks on the label products and it has suggested the methods to counter such attacks, in particular, it describes two main types of attacks – on the label and on the consumer of the product that contains the label. The analysis of counterfeiting methods and concepts of labels falsity has provided the definitions of attacks and it has described their relationship with the concepts of author's right and the original label product.

Novelty. Scientific novelty of the results is that we have revealed the main types of attacks on label products, based on which we have suggested the components containing protective functions that can counteract possible attacks. We have introduced the concept of safety for the design and manufacturing of labels.

Practical Significance. The method of identification and detection of attacks on the labels products provides the opportunity to develop an information system to protect them from falsification. The suggested components of protection against attacks can be used during the design and use of labels with the aim of providing a certain level of safety of products, customers, manufacturers and other business entities during the functioning process of the products.

ON THE SEMISCALAR EQUIVALENCE OF POLYNOMIAL MATRICES

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Research Methodology. We have used general scientific methods based on studying preliminary results on semiscalar equivalence of polynomial matrices, their improvement and introducing new research methods.

Results. We introduce a normal form for a polynomial matrix $A(x)$ written as a matrix polynomial $A(x) = Ex^m + A_1x^{m-1} + \cdots A_m$, A_i $(i = 1, 2, \ldots, m)$ with respect to semiscalar equivalence.

Novelty. The properties of companion matrix for a given polynomial matrix have been used in the research of an issue on semiscalar equivalence of polynomial matrices.

Practical Significance. The results obtained may be applied for further studied in the field, as well as in the theory of linear systems for calculations of eigenvalues.

ANALISIS OF PHENOMENA IN CONTACT AREA OF ROLLING FRICTION PAIR

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Research Methodology. Theoretical studies have been carried out using the latest achievements in the field of mechanics of machines.

Results. Decrypted phenomena, accompanied by the deformation of elastic-viscous material of a roller surface in the process of creating and rolling of a friction pair illustrate their impact on the performance characteristics of production systems.

Novelty. The results can serve as another step for better research of the contact of a friction pair as well as for practical recommendations.

Practical Significance. The process of creating the stress-strain condition of the material facing the roller and its transformation during the rotation of the pair have been analyzed. The method of calculating gear ratio of the friction pair has been presented.

BLADES ATTACK ANGLE AS AN IMPORTANT FACTOR OF QUALITY AND ACCURACY TRIMMING OF BOOK AND JOURNAL BLOCKS

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Research Methodology. The methodological basis of the research of book blocks trimming process by a multi-blade cutting tool during their movement by circular trajectory is the system of mathematical modeling *MathCAD*, the computer-aided design *AutoCAD*, the software for spreadsheet processing *Microsoft Office Excel*. The method of system analysis and modeling has been widely used in the paper.

Results. The studies have shown that the angle of attack changes in a large range during the block trimming cycle. The value and the range of the attack angle changes are affected by the geometric dimensions of books and journal blocks and the radius of its rotation, the geometric dimensions of the cutting tool. Thus, while trimming the book block with the height of 210 mm and the thickness of 10 mm during the movement in the circular trajectory with the radius of 400 mm and a constant initial installation blade angle 70 ° and the cutting depth of each blade in a block at the depth of 0.5 mm, the angle of attack varies from 66 ° to 20 °. Reducing the initial blades installation angle leads to the reduction of attack angles at the beginning and at the final stage of trimming. The studies have shown that the initial angle of multi-blade installation of the cutting tool must not be the same for all blades set. When the initial blade installation angle is 50 ° the angle of attack during the first cutting of the blade set is 46 °, and the last blade cutting tool – 0 °.

Novelty. The research results have been obtained for the first time and represent the scientific novelty, as a new way of blocks trimming during their transportation and the tool for its implementation. The analytical dependency of the angle determination of the vector inclination of books and journal block linear speed to the cutting edge of individual blades of multi-blade cutting tool has been received.

Practical Significance. The results of theoretical studies set the pre-conditions for the optimization of technological parameters of the trimming process, geometric dimensions of a multi-blade cutting tool, which is important when developing new and modernizing the existing equipment.

AN IMPROVED MECHANISM OF FEEDING UNIT OF "HEIDELBERG GTO 52" PRESS

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Research Methodology. The analysis of kinematic and energy-power descriptions is conducted in the system of *Solidworks* with the help of the module *COSMOS Motion* with the use of the method of single mechanisms of the theory of similarity of machines, the mathematical editor *MathCAD* and the spreadsheets *MS Excel*. The automated modelling of the real mechanism of a feeding drive has been done by the method of modelling in the systems of *AutoCAD* and *Solidworks*.

Results. As a result of the improvement of a feeding drive mechanism due to the application of programmable-changeable length of yoke in a four-part joint-lever mechanism, the duration of working stroke of its head is increased by 10%, that provides standing in extreme positions for the exact alignment of the sheet in two front and side supports before feeding to the vorgreifer in a printing section. Structural sizes of parts during the offered modernization of the mechanism are adjusted so that a mechanism is «fitted» into the construction of a serial machine.

Novelty. On the basis of the conducted kinematic researches of the existing feeding drive, the authors have developed a new one, using the same four-part mechanism, in which a piston-rod brings a yoke over, the length of which changes at co-operating of the roller fastened at a top of a piston-rod with an immobile profile and simultaneously brings a stone over in to the slot of side scene placed in the same yoke.

Practical Significance. The application of programmable-variable length of a yoke in a four-part joint mechanism has allowed to decrease the invariants of angular accelerations of the yoke in 1,4 times during the direct motion which will provide the high-quality alignment of the sheet in front and in side supports before before feeding to the vorgreifer in a printing section as compared to an existent mechanism. Thus the accelerations during a countermove were increased only in 1,14 times, that will not influence on the capacity of a feeder at the increase of the productivity to 14 %. The advantages of the mechanism are insignificant operating efforts which are caused by moving of stone, in fact there are the forces of friction at the step of stone on a side scene and the force of pressure operate only at moving of roller on a curvilinear type. Structural sizes of parts of the offered mechanism are «fitted» into the construction of a serial machine and can be used both for the modernization of existing and the development of a feeder of a new press.

SYNTHESIS OF A MODEL OF COMPOSITION DESIGN FACTORS OF A WEB APPLICATION FOR DISTANCE LEARNING

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Research Methodology. The methodological basis of the study is made by the developments of domestic and foreign scientists. To achieve the objectives of the work we have used: the methods of system and matrix analysis, the graph theory – to highlight and formalize links between the influence factors on the composition design of a web application; the theory of hierarchical systems –for modelling the priority of the impact factors on the process of designing web applications.

Results. In the result of the research and the conducted operations on elements of the original graph, we have obtained an ordered set of factors numbers, each, according to the calculations, takes a separate level of hierarchy. The analysis describes their relationship and singles out important factors influencing the composition design of web applications.

Novelty. Scientific novelty of the results is that using the graph theory we have developed an optimized model that shows the effect of the examined factors in the composition design of web applications for distance learning and they are given a certain level of the importance hierarchy.

Practical Significance. The graph theory allows designers to set the priorities easily in the development of web applications still in the early stages of design and discard the less important factors, providing saving of time and resources. The results can be valuable in the design of electronic books and setting them a certain composition design.

TECHNOLOGICAL MAINTANENCE OF EFFICIENCY OF METALLIC POWDERS DISTRIBUTION IN ELECTROSTATIC CLASSIFIERS

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Research Methodology. The analysis of the existing methods of classification of powder materials, characterized by a number of physical, mechanical and technological properties has been conducted. An important condition for the further development and improvement of this sector and optimizing the granulometric composition of powder materials is the classification of finely grounded materials in an electrostatic field.

Results. On the basis of the research, an effective method of the classification of powder materials in an electrostatic field on their size and the improvement of granulometric composition using blocks classification has been developed.

Novelty. The analysis of existing methods suitable for the implementation process of the classification of powder materials has been done. Based on the analysis, the innovative ways of improving the process of classification of powder materials using electrostatic field of high voltage have been determined.

Practical Significance. The technological schemes of modular blocks of electrostatic classifiers and methods of their composition in the classification line of a horizontal, vertical or combined placement, depending on the production program, the fractional composition of the finished product and the properties of the original material have been developed.

ENTERPRIZE ECONOMIC SAFETY WHILE USING SEMANTIC PROTECTION OF INFORMATION IN AUTOMATED RECORD-KEEPING SYSTEM

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Research Methodology. The study has used a general scientific method as well as a highly technical scientific method. These general scientific methods, as a generalization, analysis, synthesis were used to identify the state of the problem. When considering issues of economic safety we have taken into consideration the conceptual and resource-functional approach. To develop practical recommendations for optimizing the use of automated record-keeping in a context of economic safety we have taken into account domestic science developed methods of information protection in automated record-keeping systems based on semantic analysis of documents.

Results. The conducted study presents the peculiarities of the use of automated record-keeping in a context of economic safety. These methods of information protection in automated record-keeping systems for maintaining it throughout the life cycle have been described. The measures of economic security at potential dangers and threats that may exist for documents at different stages of their passage, and the model of automated workflow security company. The measures of enterprise economic safety at the potential dangers and threats that may exist for the documents at different stages of their passage have been determined and the model of automated enterprise record-keeping safety system has been suggested.

Novelty. Scientific novelty is in the fact that measures to optimize the use of automated record-keeping for a specific printing company have been developed to ensure the information protection and countering threats.

Practical Significance. The article offers a customized automated record-keeping system for the company "Biblios". Since electronic record-keeping has now become a demand of time creating measures of economic safety of the enterprise, we should take into account the dangers and threats that may exist for documents at different stages of their passage, and implement such models of automated record-keeping that meet modern requirements.