MATHEMATICAL MODELLING IN NATURAL SCIENCES AND INFORMATION TECHNOLOGIES

USE PRINCIPAL COMPONENT ANALYSIS TO CLUSTERING IMAGES OF FACES

Shumeiko A.A., Bratuta M.

Abstract

The range of tasks considered in image processing (Image Processing) is quite large, and among them an important role is played by problems related to the perception of human faces. This is finding on the image of a human face, identifying this person or analyzing the resulting image to assess the aggressiveness of the person, gender, age and other characteristics. One of the tasks is finding a person of the same type in the sample. What is the "similarity" of human faces. This question is not only and not so much mathematical as psychological, an example of this is Leopold Sondi's test. But, nevertheless, the task of "similarity" will always be of interest to a person, the eternal problem is who the child looks like. On the other hand, there are many years of observations that say that quite often in happy families, the spouses are similar to each other. What is primary - happy, because they are similar or similar, because they are happy? And it does not matter. What is important is that the task of likeness of individuals is meaningful and interesting in itself.

Formulation of the problem. Let there be given a lot of images of human faces and an image for which one of the most similar ones should be selected and order them by rating (degree of similarity).

In the paper, clustering faces images by the k-means method is suggested. The center of the cluster using the main component of the Principal Component Analysis clusters elements. As a criterion of proximity, the values of the corresponding coefficients are used. The application of the resulting clusterization to the solution of the problem of finding the persons most similar to the test image is considered.

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CONSTRUCTION ASYMPTOTICALLY OPTIMUM ALGORITHM OF CALCULATIONS EQUIDISTANT POLYLINES

Korotkov V.S.

Abstract

In practice, when manufacturing high-precision products containing surfaces of complex spatial shape, it becomes necessary to record complex contours of parts by simple methods.

In the process of metalworking, it often becomes necessary to construct curves that are remote from any basic curve by a given distance. Such tasks, for example, arise in the design of manufacturing techniques for voluminous stamps, in the aviation and shipbuilding industries, in calculating the trajectories of tools for contour milling on CNC machines, and so on.

The ability to control the construction process, for example, equidistant curves with a set accuracy, extends the possibilities of the process of automated design of products of complex spatial shape. Later, when implementing developments in equipment management systems, the prerequisites for the corresponding expansion of technological capabilities of the equipment itself are created. As a result the development of effective methods and techniques for obtaining technological curves or broken lines with the required characteristics for practical implementation on automated equipment is important.

Also creation of algorithms of calculations the equidistant of the technological curves or broken lines focused on use in computer facilities of a CAD and also directly in computers of machine control systems is important too.

It is expedient to consider experience of creation asymptotically of optimum algorithms of calculations of interpolation broken lines with minimum possible quantity of links at the set tolerance zone. They it is much simpler in realization, and the received results practically don't differ from optimum.

Construction the equidistant of curves in relation to the optimum curve which is available asymptotically allows to increase the accuracy of the description of certain parts approximately twice, at invariable quantity of units of a broken line. Such approach to the solution of a task creates prerequisites for the solution of some specific processing methods at production of products. The essence of a method is that again constructed broken line, with uniform removal from earlier known, can be constructed by way of her movement of some identical distance for each unit. And, if the curve is convex up - the equidistant broken line rises by the size equal to a half of the tolerance, and if it is convex down – the broken line falls by the size equal to a half of the tolerance.

The developed algorithm allows to obtain asymptotically optimal trajectory of the cutting tool movement, for example, in contour milling. In this case, the trajectory of motion is equidistant and will have an asymptotically minimal number of units. Application of algorithms on CNC machines allows to expand the technological capabilities of existing methods for calculating the trajectories of axial tools (for example, milling cutters) when preparing control programs.

The developed algorithm allows to receive asymptotically an optimum trajectory of the movement of the cutting tool for example in contour milling. In this case the trajectory of the movement was equidistant and will have asymptotically the minimum number of units. Application of algorithms on CNC machines allows to expand technological capabilities of the existing methods of calculations of trajectories of the movement of axial tools (for example mills) when preparing management programs.

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COMPUTATIONAL TECHNOLOGIES FOR THE CALCULATION OF MATHEMATICAL MODELS

Krasnikov K.S.

Abstract

The author focus on the problem of increasing of computational efficiency of three-dimensional mathematical model that was developed earlier. One of the pecularities of compound math models is the requirement of a large number of arithmetic operations and the calculation of large data arrays, which affects the time of calculation, which can last for a several days without acceleration. Due to the development of computer technology, today there are methods to significantly increase the speed of computing by using parallel technologies in the program code.

The purpose of the work is to increase the speed of computations in a computer program with increasing number of cores using modern programming concepts and achivements in processor industry. It is considired four levels of paralelism in a computer program.

It is suggested to use the second level of the mentioned parallelization of computations for the solution of the system of linear algebraic equations for the dynamics of the solids system: each number in the row of the matrix is multiplied by the corresponding number in the vector of values and the result is added. Instead of

consistently completing the addition and product, it is recommended to use the appropriate processor instruction. An arithmetic addition operation is usually performed sequentially, but this sequence can be parsed for acceleration if the set of numbers for a sum is sufficiently large. The third level is proposed to be used in the calculation of hydrodynamics, by dividing the calculated area into parts, each of which is calculated independently at each stage of the mathematical model. The fourth level approaches the delimitation of the calculation of the mathematical model of the physical process being investigated and the calculations associated with obtaining the 3D image of the results obtained if they are combined into a single computer program.

As a result of the parallelization of computer program, it has accelerated by around 1.5 times. The image processing task is very well suited for parallelizing because almost 100% of the calculations are distributed between processors. In result acceleration corresponds to an increase in the number of streams involved. Future investigation will be devoted to computing using general purpose GPU.

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MODELLING AND OPTIMIZATION IN MATERIAL CONSTRUCTION TECHNOLOGY

MATHEMATICAL MODELING FORMATION OF FORCES OF CUTTING TO CUT IN HALF AUTOMOBILE PNEUMATIC TIRES

Sasov O.O., Korobochka O.M., Volosova N.M.

Abstract

The resulting mathematical model of the formation of cutting forces in the cutting of worn-out automobile pneumatic tires in half with a cutting tool made of alloy grades P6M5 and T15K6. The mathematical model expresses the dependence of the cutting forces on the set of geometric parameters and hardness of the material of the cutting tool and the operating parameters of the cutting. With its help, it is possible to define a set of optimal geometric parameters, cutting tool material and operating parameters that ensure minimization of cutting forces and energy consumption for the cutting process as a whole. The mathematical model was refined taking into account the obtained equation of the dependence of the cutting forces on the ultimate strength of car tire materials. The adequacy of the refined model was confirmed by an estimate of the homogeneity of variances in the calculated and experimental values of the cutting forces using the Fisher statistical test. The effective mode parameters are determined: the speed of the spindle of the machine and the feeding of the cutting tool, the geometric parameters and the hardness of the material of the cutting tool, which ensure minimum energy costs. A comparative analysis of the energy consumption of the process of cutting the worn out tires in half to optimize the operating parameters and after it.

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THE SIMULATION OF STRAINED CONDITION METALL IN OVAL - ROUND PASSES

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Abstract

In the present paper, it is proposed to use the variational principles of continuum mechanics based on the minimum properties of the actual velocity field when solving the problem of metal forming during rolling in calibers. The most developed are the two methods for solving the variational problems of metal forming now - the finite element method and the Ritz method. The commercial finite-element method programs is associated with a significant cost, herewith highly qualified specialists are attracted for modeling, researching and processing the data obtained what requires additional costs. On the other hand, optimization of the production process on the basis of only experimental studies is associated with significant time and financial costs, and therefore also ineffective. So at present, high-speed, simplified computer packages for the automated design of new and improving working calibrations for rolling different profiles are becoming relevant.

The object of this paper is design of the universal mathematical model of metal forming during rolling in oval - round passes.

Before determined the shape change of metal during rolling in system from oval - round caliberes, the profile of the bar and the caliber contour are replaced by equivalent rectangular cross-sections by the method of the corresponding bar. Then the variational problem is solved by the method of Ritz. And the elongation coefficient is found as result. The width and the shape of side surface bar after rolling is determined wich based on the area of the finished profile obtained as a result of solving the variational task. The program was elaborate for determining shape change of bar during rolling in round and oval calibers on base of proposed universal mathematical model of the rolling process of simple profiles in the oval - round passes. The program allows to build a contour of bar and a caliber filled with metal.

The mathematical model can be used for researching shape change of metal during rolling on bar and wire rod mills in system from oval - round calibers. Also, this model is recommended for use as a calculation module in determining the deformation of the bar during rolling in high-speed wire rod blocks with a common drive.

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INVESTIGATION OF THE INFLUENCE OF THE CURRENT FREQUENCY ON THE RESISTANCE OF THE INDUCTION RHEOSTAT BY MEANS OF THE SOLUTION OF FIELD EQUATIONS IN THE 3D FORMULATION.

Syanov O.M., Kosuhina O.S., Polyakov R.M.

Abstract

The purpose of the work is to create a model of "classical" design of IP and conducting numerical studies, due to the results one can corroborate or knock the bottom out of the possibility of reducing the copper coil by increasing the frequency of supply voltage.

As a result of the simulation and calculations, it may be concluded that increasing the frequency of power supply in the IP leads to the possibility of reducing the number of turns in the coil and reducing its weight almost

twice. As it can be seen from the simulation results, this is exactly resistive indicators, further increase of frequency allows to reduce the number of turns of the coil in several times.

Thus, according to the mathematical IP models realized in the nonlinear software environment, improvement of the design of the IP in the direction of reduction of mass-overall measures is technically practicable and economically sound. Further research in this direction can lead to a decrease in the thickness of the plates and the outer and inner diameter of the IR ring.

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MODELING OF OBTAINING WELDING PROTECTIVE COATINGS UNDER THE CONDITIONS OF SELF-SPREADING HIGH-TEMPERATURE SYNTHESIS

Beigyl O.A., Sereda D.B.

Abstract

Practical use of carbon-carbon composite materials (CCCM) in high-temperature processes is very limited due to strong oxidation, as well as erosion and burn-up in gas streams. In this regard, protecting the CCCM from oxidation and burnup is an important scientific and technical task. Prospective materials for applying protective coatings can be refractory compounds, especially carbides, borides, nitrides and silicides, as well as alloys based on them. In addition to protection from oxidation, coatings made from refractory compounds have high hardness and wear resistance.

Known methods for obtaining coatings have a number of disadvantages and advantages. The most unacceptable is the fact that when the coating is impregnated with Si silicon from the liquid phase, the chemical interaction with the matrix of CCCM occurs and a carbide phase is formed, while the mechanical characteristics of the material change, as well as the fact that the carbide component is formed unevenly along the section of the base material.

One of the most promising methods of HTO today is self-propagating high-temperature synthesis (SHS). From the analysis of the requirements for coatings on the CCCM, a diffusion method of surface saturation from the solid phase in the active gas medium in the SHS mode was chosen. A distinctive feature of this method is the high quality of the resulting coating surface, short duration, and high temperatures, which are characterized by the composition of the SHS mixture. Under the conditions of SHS, it is possible to obtain coatings of different chemical composition, varying the amount and content of alloying additives.

In the coating application, CCCM was used. Chemical-thermal treatment was carried out in an open-type reactor (P = 105 Pa) in the temperature range 900-1100 ^{o}C and the total duration of isothermal exposure to 60 min.

In order to search for compositions of powder SHS mixtures providing high wear resistance, a full factor experiment

The choice of the optimum composition of the mixture for conducting SHS processes in the conditions of thermal auto ignition was carried out on the basis of the results of studies of the thermal picture of the SHS process and the physical and mechanical properties of the protective coatings

The best heat resistance among the coatings under consideration are chromoaluminosilicate coatings. Their weight loss index was $33\text{-}50\cdot10^{-4}$ g/m^2, which is 1.5-1.7 times higher than for coatings obtained under isothermal conditions.

The method of coating with SHS allows obtaining CCCM with increased physical and mechanical properties, without requiring high energy costs and time.

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MATHEMATICAL MODEL OF STRESS-STRAIN STATE OF THE RETORT IN THE REDUCTION PROCESS OF TITANIUM TETRACHLORIDE

Evseeva N.O., Mishchenko V.G., Bagriichuk O.S.

Abstract

Global titanium sponge manufacturers face a serious problem – distortion of reactors during the process of producing titanium sponge by magnesium-thermal method. Under the influence of such process reactors are early removed from service and production costs are increased. Solving this problem can significantly improve the efficiency of the titanium industry enterprises.

Analysis of reactors in stress-strained state was carried out with regard to operating conditions and physical and mechanical properties of materials. Deformation of reactors is caused by variety of negative factors: uneven heating of reactors in furnace; effect of gauge argon steam pressure $p_0 = 0{,}03$ MPa on a side wall in reduction reaction zone**;** act of axial strain on flange by reactor vessel and reacting mass $P = 10^4 ... 10^5$ N depending on the type of reactor.

The character of strain and hogging of reactors shows the necessity of consideration of nonlinear processes (plastic flow and fluidity) when constructing their physical-mathematical model.

The purpose of the work is the stress-strain state analyze of the retort, taking into account the conditions of their operation and the physical properties of the materials.

For the calculation it is necessary to use the temperature dependences of the reactor material coefficients in the system of equations. Thus as a material was chosen widely used steel AISI 321.

Simulation of the process showed, that reactor wall deformation is caused mainly by thermal expansion of the material under the effect of an inhomogeneous temperature field.

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MODELING OF SOLUBILITY OF METALS X (Cr, Mn, Co, Ni, Cu) IN FERRITE

Filonenko N.Lu., Baskevich A.S.

Abstract

In this paper, the structural characteristics of the ferrite, the possible positions of the atoms of the alloying elements and the carbon in the ferrite grid were investigated and determined. It is established that the insignificant solubility of carbon in the ferrite is due to the fact that the penetration of the carbon atom into the lattice causes a significant deformation of the lattice, which leads to the fact that much of the pores are not filled with carbon atoms. Because of this, the atoms of other elements can penetrate the pores. Using the quasi-chemical method has allowed to determine the limit of solubility in ferrites of such metal atoms as chromium, manganese, cobalt, nickel and copper, depending on temperature. The results of the solution of the system of thermodynamic equations have shown that at temperature T = 300 K ferrite has the following content of elements: Mn = 4.8% (at), Co = 8.95%, Cr = 0.34% (at.), Cu = 0.4% (at.) And Ni = 7.48% (at.). With an increase in temperature to 900 K, the content of the elements increases to Mn = 10.1% (at), Co = 7.95% (at), Cr = 12.3% (at.), Cu = 1.54% (at .) and Ni = 3.17% (at.). The analysis of the results allowed to determine the solubility of manganese, cobalt, chromium, copper and nickel in ferrite. In addition, it was found that up to 0.11% (atoms) of carbon atoms can penetrate the ferrite grating, depending on the temperature in both the octahedral and tetrahedral times, by ferrating with metal atoms X (Cr, Mn, Co, Ni, Cu) Also, with the help of the quasi-chemical method, the free energy of the ferrite is obtained, depending on the content of the alloying elements, namely, metal atoms X (Cr, Mn, Co, Ni, Cu). The solubility limit of these elements in the ferrite is determined. With increasing temperatures, the solubility of carbon in these phases increases. This method allows one to predict the physical properties of the ferrite and the lossy phases that can be formed depending on the content of the alloying elements in the steel or alloy. The calculated data obtained in the work are in good agreement with the experimental data.

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OPTIMIZATION OF TECHNOLOGY OF RECEIPT OF MULTICOMPONENT COVERINGS ON BASIS OF TITAN IN THE CONDITIONS OF SHS.

Sereda B.P., Palekhova I.V., Kruglyak I.V.

Abstract

One of effective methods of chemical - thermal treatment , allowing to improve corrosive, wearproofness, heat-tolerance of steel details, there is a joint satiation titan and aluminium from powder-like environments. The traditional methods of chemical - thermal treatment are characterized thus considerable duration of process and high maintenance of m of basic saturant elements in powder-like mixture. In this connection, application of technologies allowing to get coverage at a limit or minimum time of their forming is actual, and also to bring down the percentage of saturant elements in mixtures at maintenance of operating properties of coverings.

Authors are consider gas-transport SHS- technology of receipt of multicomponent titanic coverings in the mode of thermal spontaneous combustion. An aim hired is development of optimal compositions of powder-like SHS- mixes for causing of titanic-alumunium coverings in the mode of thermal spontaneous combustion, study of influence of additions-catalysts on thermophysical properties of SHS-mixes and flowing of process of diffusive satiation in non-stationary temperature terms. Comparative analysis of technological parameters of SHS- process, structure, phase, chemical composition and properties of the coverings got in SHS-mixes without additions of metals-activators and with them, and also estimation of quality of the formed coverings.

Drawn conclusion authors about expedience of application of SHS-technology for the receipt of multicomponent wearproof coverings on steels. For intensification of processes of diffusive satiation and decline of energy consumptions on the stage of the inert warming up, introduction can be recommended in the complement of reactionary mixtures of metals-catalysts. As a result of researches drawn conclusion, that titanic-aluminized became with SHS-coverings as compared to diffusive analogues possess the improved operating properties at the decline of duration of treatment.

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MODELING OF THE APPROACHES OF MILLING THE DIFFERENT TYPES OF ORES SPECIFIC FIELD IN A BALL MILL CLOSED CYCLE

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Abstract

Taking into account that the non-optimal variant of grinding different types of ores of a particular deposit leads to a decrease in productivity, losses of the useful component and the growth of energy consumption, balls and lining, the topic of this article is relevant.

The aim of this work is to simulate approaches for grinding various types of ores at a concentrating mill with certain characteristics of the field, aimed at finding an option for more optimal processing of raw materials.

Achievement of the set goal implies the solution of the following tasks: analysis of the main technological characteristics of the deposit ores; modeling of approaches for grinding ores by ball mills and developing specific recommendations for their processing; justification of feasibility and possibility of providing grinding of ores in accordance with the proposed recommendations.

The analysis showed that the ores in the deposit are of great variety and constitute a full range - from easily enriched to very heavily enriched. They are represented by seven types. Some types of ores have the same mean values of magnetite impregnation, the same values of the grindability factor and the average size of the magnetite impregnation, but it is proved that it is inexpedient to process them together. The greatest effect will be with the separate grinding of all seven types of ores. It is shown that such processing of ores can be carried out. In the basis of recognition of individual types of ores in the process of their extraction, it is expediently to put the specific magnetic susceptibility, but in addition it is necessary to use one more information factor. It is expediently to apply the recently proposed mobile crushing and sorting radiometric complexes, adapted to solve these problems. The preliminary dry enrichment of ores before grinding practically does not change anything, since they completely retain the properties of a particular type of mineral.

Modeling has shown that it is expediently to crush ore separately, despite the external possibility of joint processing of some types. Separate grinding will ensure the highest efficiency and transition to more rational schemes of classification of individual types of ores in the process of their extraction.

The prospect of further research is the modeling of a ball mill and a single-spiral classifier as controllable objects in permitting the processing of certain types of ores and the creation of efficient automated control systems for such processes.

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THE MODELING OF THE KINETICS FORMATION OF INTERMETALLIC ALLOYS UNDER SELF-PROPAGATING HIGH-TEMPERATURE SYNTHESIS

Sereda B.P., Kruglyak I.V., Belokon Y.A., Belokon K.V., Zherebtsov A.A.

Abstract

When evaluating the possibilities of obtaining various inorganic compounds, including intermetallides, by the method of self-propagating high-temperature synthesis (SHS), kinetic analysis becomes more important, first of all, the determination of the critical conditions for the process. Therefore, the problem arises of determining the analytical equations of the temperature-time dependences of the formation of intermetallides in the Ni-Al system and their activation energy.

The intermetallide systems of Ni-Al are chosen for the study. This system belongs to the group of intermetallic systems in which the adiabatic combustion temperature is equal to the melting point of the product formed ($T_m = T_{ad}$).

Analytic equations of the temperature-time dependences of the formation of intermetallides in the Ni-Al system and their activation energy are obtained on the basis of experimental methods for studying the kinetics of

the interaction of intermetallic alloys under conditions of self-propagating high-temperature synthesis. An investigation of the laws of heat release during thermal autoignition made it possible to establish the following sequence of reactions: $NiAl_3 \rightarrow Ni_2Al_3 \rightarrow NiAl$. It is established that for the reaction of the interaction of nickel and aluminum with the formation of the first crystals of intermetallides, the activation energy is 42.917 kJ. Also in the work, on the basis of the Johnson-Mel-Avrami-Kolmogorov model, the dependences determining the temperature and the synthesis time at which the required degree of chemical transformation is achieved are obtained. Varying the synthesis temperature, and hence the speed below the ignition limit, allows us to find the value at which the required degree of chemical transformation is achieved within the established synthesis time. Thus, at a temperature of maximum ignition of 530 °C, the total depth of the chemical transformation is reached in 220 s, the temperature decrease to 490 °C leads to an increase in the synthesis time by a factor of 2.

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SIMULATION OF WORKING LOAD ON TECHNOLOGICAL SYSTEM OF CNC MACHINE

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Abstract

During the operation of CNC machines many factors that affect the accuracy and quality of machined parts, reduce reliability of operation of machines on ensure the operating modes set in the control programs. Conducting scheduled inspections and repairs does not guarantee the conformity of the technical state of the machine with its passport data during the entire period of operation.

The problem of ensuring high technological reliability of CNC machines is accompanied by obtaining reliable and timely information about the equipment and making of necessary measures for recovery of their characteristics.

Information about the condition of the machine can be obtained by simulating the operating modes of the equipment and determining the reaction of the technological system to these actions. To process the results obtained, it is also necessary to develop a mathematical model.

For carrying out tests for technological reliability the diagnostic device is under production conditions developed a diagnostic device for milling machines with a vertical arrangement of a spindle. It allows identify many important characteristics of CNC machines: positioning accuracy, size of spindle beating during load simulation, data on elastic deformations of machines units, etc.

The device is made in the form of a separate unit, which is installed on the table of the machine. In the body of the device there is a measuring plate with contact bushings installed in it. The position of the plate and bushings in space is determined by the linear displacement meters. Hydraulic cylinders create an imitation of efforts on the machine. When the bushings and the mandrel are in contact, according to the control program, the plate is displaced in space. The size of shift is defined by measuring instruments.

As a result, a test procedure was developed, based on the results of which it is possible to determine the main characteristics of the machine both in simulating workloads and without loads. If necessary, it is possible to perform tests to determine the individual characteristics that are of interest to the user.

A mathematical model for the processing of test results has been developed. The model is based on the universal matrix of coordinate transformation. Calculation of the results occurs with the use of computer hardware.

The use of the developed device in the production allows the express control of CNC milling machines for technological reliability. For the testing, no changes in the design of the machines are required. The information obtained can be used to create the conditions for effective use of equipment and reduce the cost of manufactured products.

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MATHEMATICAL MODEL OF A VIBRATION TABLE FOR REMOVING RESIDUAL STRESSES IN WELDED PIPES

Krivoruchko A.M., Kadilnikov S.V.

Abstract

At present, in connection with the intensive development of computer technology, it became possible to use more universal methods, characterized by the simplicity of setting the initial information and fundamentally new conditions for the widespread use of vibration processing in the production and operation of general-purpose welded structures.

Each of the known methods for reducing residual stresses has a more or less limited area of rational use, so there is a need for both improving existing and searching for fundamentally new methods of post-welding treatment of pipes in order to remove residual stresses, as well as hardening, stabilizing the geometry, and changing the structural state.

Vibration treatment is proposed to reduce residual stresses in welded pipes. A mathematical and constructional model of the vibration table has been developed. A rational choice is made of the electric vibrator and the location of the electric motor, which makes it possible to obtain in the test sample uniform vibrations along the entire length of the working zone.

When manufacturing the vibration table, elements of its vibration isolation are calculated - spring and rubber shock absorbers, a suitable variant of vibration supports was chosen, which makes it possible to increase the economy of the process without producing unnecessary expenses for expensive and complex foundation manufacture.

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MATHEMATICAL METHODS IN SOCIAL AND HUMANITARIAN SCIENCES

PROJECT MANAGEMENT AS AN OBJECT OF MATHEMATICAL MODELING OF COMPLEX TECHNICAL SYSTEMS

Grigorenko V.Y., Kadilnikova T.M.

Abstract

Currently managing projects consistently serves as a systematic information and analytical process, the effectiveness of which depends on the level of modern information technologies and systems to support decision-making; the perfection of the modern mathematical models and computational methods; versatility and mobility systems hardware and software simulation.

Despite the fact that in recent time gained significant scientific-theoretical and methodological potential in the development of hardware and software methods and tools for modelling complex technical objects, systems research, which allows working with mathematical and computer modelling of the current state of the project, actually not yet carried out.

The purpose of this work is to carry out systematic research, allowing to prove the feasibility of works on mathematical and computer modelling of the technical state of the project.

The proposed system, which is based on complex theoretical and informational methods and means of determining the parameters, setting their interrelationships and patterns of influence on the characteristics of the project, justified by its functions and characteristics. The application of systems of assessment allows to predict the direction of innovation and to design systems based on object-oriented approach.

The combination of a mathematical, technological and organizational component in the framework of a unified strategy allows the organizations and executives to draw conclusions about the nature of possible management decisions, the timing of their adoption.

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EVALUATION OF EXTERNAL RISK BY MEANS OF FUZZY LOGIC
Dranishnikov L.V., Suhal E.O.

Abstract

The article deals with the actual issue of applying fuzzy logic to assess external risks. To create a methodology for risk assessment, it is necessary to develop an expert system that would be implemented as a system of fuzzy inference and would allow to determine the magnitude of the risk on the basis of subjective assessments of all levels of security. To model the expert system, the MATLAB-Fuzzy Logic Toolbox was used - the MATLAB extension package containing tools for designing fuzzy logic systems. Fuzzy inference systems are designed to convert the values of the input variables of the control process into output variables based on the use of fuzzy product rules. For this, the fuzzy inference system should contain a base of rules for fuzzy products and implement a fuzzy derivation of the endings on the basis of premises or conditions represented in the form of fuzzy linguistic utterances.

Managers have set themselves the task of assessing the risk of operating activities of the enterprise on the livelihoods of employees and residents of the territory located near the enterprise. To do this, input variables were assigned, which are risk factors: the reliability of the vital safety system; the consequences of a chlorine leak. The initial variable was the degree of risk. To assess the first of the input variables, the expert compiled a table of criteria for the reliability of the life safety system, according to which the group assessed it at the enterprise. To define the membership functions, a trapezoidal and triangular shape was used. The evaluation of the second input variable was based on an analysis of the chlorine pressure (concentration) in the reservoir. To do this, the experts compiled a table of the "seriousness" of consequences in the event of a chlorine leak. According to the formulated rules, and using the Mamdani's fuzzy withdrawal algorithm, an initial risk assessment was obtained.

The authors believe that this technique makes it possible to assess the risks of industrial safety with the use of fuzzy logic and allows us to visually present the state of the life safety system, as well as to comprehensively evaluate possible security threats and obtain risk assessments.

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MATHEMATICAL MODELING OF THE CURRENT STATE OF THE PROJECT AND IMPLEMENTATION OF MONITORING STUDIES
Grigorenko V.Y., Kadilnikova T.M. , Kadilnikova A.V.

Abstract

Currently, system management and project activities find their place in the modern elements of a market economy and are widely used for both complex and relatively simple specific tasks. The creation and implementation of modern systems of evaluation of the status of projects is an urgent task and allows you to make managerial decisions in the process of theoretical development and practical implementation of the project.

Analyzing the functioning of any project is almost always possible to allocate its main characteristics: time, budget and quality of work that you need to constantly manage that assumes constant control over the processes of receiving, processing and accumulation of information. The information contains actual data on the progress of works and their comparison with the planned indicators, the analysis of the possible impact of deviations in the executed volumes of works on project implementation in general and in developing appropriate management decisions, that is, has a very large volume, which is constantly expanding.

Proposed and implemented a strategy of designing and monitoring research projects, which allows predicting the direction of the implementation of projects based on object-oriented approach. The features of the monitoring system and rules of practical implementation are determined. The proposed system of monitoring is

carried out by choosing the best option for management decisions taking into account analytical information on the current status; makes periodic audit and adjustment; determines the necessary volume of funds for work on the development of the control system.

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MATHEMATICAL MODELING OF THE DECISION-MAKING PROCESS TAKING INTO ACCOUNT THE LEVEL OF COMPETENCE OF THE PROJECT MANAGER

A.I. Mazurkevich, V.U. Hrygorenko, S.V. Antonenko

Abstract

According to the research of the Association of Project Managers of the UK for the project manager, the most important characteristics are the understanding of the project (88% of respondents), communication skills (81%), decision-making (69%). Procedures for the formation of the system objectives, options for their implementation, models, criteria can not usually be fully formalized. There arises the problem of creating a special decision-making method in conditions of uncertainty, taking into account the personal characteristics of the person making the decision, and sufficiently simple to process and comprehend the initial data and results obtained during the implementation of this method.

The aim of the study is to develop a mathematical model (algorithm) for decision-making that meets all the above requirements.

The decision-making process can occur with varying degrees of awareness of the decision-maker. When modeling real systems, situations can arise where the decision-maker does not have a clear idea of the relation of preference between all or some alternatives, and one can only estimate the degree of fulfillment of a preference relation between pairs of alternatives in the form of a number in the interval [0; 1]. It is proposed to supplement the corresponding algorithm based on the personal characteristics of the decision maker. For this, the work of A. Blinov on the logical prerequisite for decision-making, supplemented by the information approach to the emotions of P.V. Simonov.

The authors developed a mathematical method of decision-making, taking into account the level of competence of the decision-maker, which makes it possible to link alternative and competence approaches to the management of projects and programs in a single system. The method also makes it possible to reduce the level of inaccuracy of expert assessments in the analysis of various aspects of the project or program, allows to simulate possible versions of the adopted decision for decision-makers with different levels of competence.

The main prospect for the development of this direction is the algorithmization of the method, with respect to the creation of a computer algorithm and a program implementing this method.

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SIMULATION IN THE PROCESS OF MAKING DECISIONS ABOUT PURCHASING EQUIPMENT TAKING INTO ACCOUNT THE LIMITATIONS OF THE LOCATION AND OF THE SIZE THE INVESTMENT

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Abstract

In the process of making administrative decisions frequently adapt the methods of the mathematical programming, realization of which is connected with the need for the mastery of sufficiently complex mathematical apparatus and the large volume of calculations. For the specialists, whose basic work is not connected with mathematics, this approach leads to some difficulties and creates the imperative need for the search of the alternative methods of solution of problem.

The purpose of a study is the analysis of the special features of the use of a tabular processor MS Excel for the solution of the problems of integral linear programming, development and approval of two-stage algorithm for solving the optimization problem of the distribution of investments into the acquisition of equipment.

The formulation of the problem assumes the acquisition of the equipment of several forms for the modernization of production with the limitations to the area of arrangement and the size of investments. Basic

purpose is to ensure maximum general productivity. Case study showed that there are several versions of the solution, and they are characterized by not only the distribution of investments into the purchase of the equipment of different types, but also by the necessary for the arrangement area and with the total volume of investments. Last fact gives grounds to assume classical solution of problem as the first stage of optimization. In the second stage it is proposed to solve the task of the minimization of costs of equipment. The general productivity of section must be not less than at the previous step.

The results of solution of standard problem on the basis of the approach proposed testify about the possibility of an essential improvement in the administrative solution due to the considerable savings of means for the purchase of equipment.

The most attractive features of the proposed approach include the ease of computer realization, simplicity and naturalness of the interpretation of results.

The special features of the application of the proposed approach in the cases of the introduction of the additional characteristics of equipment (reliability, the accessibility of spare parts, the operating costs, etc) require further study.

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