
Abstracts and Keywords

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Performance Comparison of Array Sorting Methods

Keywords: sorting; array element; array; algorithm; compiler; C++.

Abstract. The purpose of the study is to choose the most optimal approach for sorting a different number of elements. The article deals with the most commonly used sorting algorithms in the C++ programming language. Examples of their implementation and optimization to speed up their performance are given. Their performance is compared with a different number of data arrays, on a clean system, to identify the most optimal data sorting algorithm. The results of the conducted experiments are presented. The result of the study is to bring optimized algorithms and identify the most optimal approach for sorting a different number of elements.

A.V. Bakshevnikov, V.Yu. Belash

The Development of Controls for Virtual Tour

Keywords: movement; coordinates; simulation; tour; system.

Abstract. This article considers the development of a control that allows you to freely move through three-dimensional models in real time. Controls should be convenient, as well as intuitive for users. The purpose of the research is to create a virtual tour for Kaluga State University named after K.E. Tsiolkovsky. The hypothesis of the study lies in the popularity of the software product among users, as well as in the convenience of using such software tools. The research methods include analysis of literature on the development of virtual tours, idealization and formalization of ideas about the implementation of software products. The study resulted in a full-fledged real-time control system for the virtual tour.

E.M. Bashirova, I.I. Mamleev, A.A. Davlatov, M.F. Shvan

Improvement of the Automatic Reserve Input Control System for Power Supply Systems

Keywords: control system; automatic backup power input; computer model; uninterrupted power supply.

Abstract. When performing the project, theoretical and experimental research methods were used. The theoretical research was carried out based on the study of the theory of uninterrupted power supply of production facilities, principles of automatic control, and modeling. The experimental research, a mathematical simulation model was used to improve the quality of automatic control of reserve automatic input devices. The model was built on the initial data obtained from the selected object and implemented in Matlab Simulink.

Y.Yu. Bursian, A.M. Demin, O.V. Prourzin

The Image Binarization Algorithm for Handwriting Recognition in the System for Automated Checking of Student Works

Keywords: text recognition; cosine Fourier transform; distance learning.

Abstract. One of the important stages in the functioning of the system for automated verification of handwritten student papers is the reduction of the scanned work to a binary form, which precedes the text recognition procedure. Since well-known software does not cope well with the recognition of

handwritten text containing a large number of special characters, it was assumed that the development of its own algorithm and software based on it would make image preparation for the recognition process more efficient. The aim of the study is to increase the efficiency of preparing an image with a handwritten text containing special characters for the recognition procedure. To achieve it, the following tasks were set and completed: an algorithm was proposed and implemented in the form of a computer program for reducing a scanned handwritten student work to a binary form, based on bandpass image filtering using a discrete cosine Fourier transform. The results of testing the developed software indicate the flexibility and efficiency of the proposed algorithm.

V.V. Bykov, I.V. Akhmetov

Application of Telegram Chatbot for Surveying and Assessing Customer Preferences of Metta Ltd. Customers: Research and Analysis

Keywords: Python; SQLite3; Telegram; database; internet marketing; armchair; METTA; chatbot; electronic report.

Abstract. The Internet marketing department of Metta Ltd. uses a chatbot for chair evaluation questionnaires, which automates the process of completing chair evaluation questionnaires for customers. The purpose of using the chatbot is to improve the quality of products manufactured by the company, based on customer responses in the chatbot. Within the framework of this research such tasks as identification of "bottlenecks" in the business process of chair evaluation questionnaire, consideration of the advantages of using chatbot in the current business process, as well as description of the considered business process after the implementation of chatbot. The use of a chatbot for chair evaluation questionnaires allowed to improve the quality of the company's products.

R.Z. Valitov, D.R. Zubaydullin, S.F. Kochetkova, I.V. Prakhov

Improvement of the Automatic Control System for Cathodic Protection of Pipelines with an Isolated Power Supply System

Keywords: automatic control; cathodic protection; computer model; isolated power supply system.

Abstract. This article presents a study aimed at improving the automatic control system of cathodic protection of pipelines with an isolated power supply system using a mathematical model implemented in the Matlab Simulink environment. The main purpose of the study is to increase the efficiency and reliability of the cathodic protection system of pipelines. The main tasks: development of a mathematical model of an automatic control system for cathodic protection of pipelines, development of an isolated power supply system for cathodic protection. The basic methods and theories of mathematical model development were used in data modeling and analysis. The developed mathematical models make it possible to identify special technical problems related to the efficiency and reliability of the cathodic protection system of pipelines. The results of the study allow us to identify potential improvements in the automatic control system of cathodic protection and develop recommendations for practical.

I.Zh. Dambaeva

Strategic Partnership in Ensuring the Information Security of Agricultural Development

Keywords: digital transformation; agriculture; information security; tasks of information protection; confidentiality; transportability; strategic partnership; social technologies of information protection.

Abstract. The objectives of the study are to consider the role of strategic partnership in ensuring information security of agricultural development. The hypothesis of the study is that digital transformation in agriculture is based on the dualism of the problem of ensuring information security

between ensuring its confidentiality and transparency. The objectives are to reveal the main features of the digital transformation in agriculture; to consider the levels of economic security; to reveal the role of strategic partnership in ensuring information security. The research results are as follows: the reasons for the uncertainty of information about resources are shown, a classification of information protection tasks in agriculture is constructed, the place of information protection at the stages of strategic management decision-making is shown.

A.A. Karatayev, I.V. Nikolayeva

Cluster Analysis: Essence and Applied Value

Keywords: cluster analysis; clustering methods; hierarchical and non-hierarchical clustering methods.

Abstract. Today data analysis is an integral part of decision-making in management. For the effective use of data, statistical research methods are used, including the clustering method. The purpose of the study is to identify the essence of clustering methods and their application in various applied areas of socio-economic activity. Based on the results obtained, the main clustering techniques used in certain scientific fields are classified.

A.V. Kozlova, A.A. Pavlenko, Ye.V. Suprun

Designing a Module for Monitoring the Workload of Storage Areas in the Warehouse of Finished Products of a Manufacturing Enterprise

Keywords: monitoring; storage; management.

Abstract. The purpose of this article is to design a module to monitor the workload of storage areas in a warehouse, which supports the distribution of inventory in the process of storage and warehousing. As a result of the analysis, the main techniques for identifying workload were identified, a functional model was built, and the module itself was designed, which is equipped with a graphical component that presents to the user a map of the warehouse, which displays the degree of workload of storage areas.

A.V. Kuznetsov

Technical and Technological Solutions in the Field of Improving the Cross-Country Ability of Log Trucks

Keywords: log trucks; efficiency; cross-country ability; technical and technological solutions; logging roads.

Abstract. The study aims to evaluate technical and technological solutions in the field of improving the cross-country ability of logging vehicles when working in difficult natural and industrial conditions. The research tasks are to give an overview of technical and technological solutions in the field of improving the cross-country ability of log trucks; 2. to develop recommendations for improving the efficiency of log trucks when working in difficult natural and industrial conditions.

The paper considers technical and technological solutions for improving the cross-country ability of log trucks. The authors note that the traffic of logging vehicles is carried out on roads with different surfacing conditions, which significantly affects its cross-country ability and operational efficiency. To solve the problem, an integrated approach is needed, including both technical and technological, as well as organizational and management decisions. The effectiveness of solutions will depend on the specific area of use of logging trucks and the economic feasibility of the solutions used.

K.A. Kulakov, E.M. Bashirova, A.S. Lukin, D.V. Khlopotin

The Development of a Method to Evaluate the Technical Condition of Electric Heating Systems

Keywords: electric system; heating cable; forecast; statistics; reliability; industrial safety.

Abstract. More and more oil and gas companies are putting into operation electric heating systems, and the issue of improving the reliability of power supply of such systems remains relevant.

This article proposes a method for evaluating the technical condition of mineral insulated heating cables based on the collected statistical data on the installation under study using predictive analysis.

The paper considers two types of heating cables used in the installation under study, the scheme of the predictive approach of technical systems, the statistics of failures of cables with mineral insulation for 2021–2022, the area of admissible mechanical strength of the heating cable depending on the value of insulation resistance. Based on the available experimental data, a dependence was drawn up, according to which one can evaluate the technical condition of the electric heating system.

T.G. Oreshenko, D.K. Lobanov, S.V. Kharlashina, A.Ye. Shmidt

Application of Short-Term Forecasting Methods in the Simulation of Time Discrepancies

Keywords: on-board time scales; adaptive methods; modeling.

Abstract. The article discusses adaptive methods for predicting the time scale discrepancy. This paper describes the development of a program for choosing a method of forecasting time series and carrying out their transformations by the method of differentiation and detrending. The program allows you to predict the time scale discrepancy of the selected object for a given number of cycles using various time series modeling methods. The results of a comparative analysis of predictive methods on different sample sizes are also presented.

T.G. Oreshenko, V.R. Timofeyev, A.Ye. Shmidt

Algorithmic Provision for Motion Control of Walking Unmanned Vehicles

Keywords: servo drives; algorithm; block diagram.

Abstract. The aim of the paper was to develop a mathematical model of rectilinear movement of a walking unmanned platform. The main task of the study was to determine the parameters and the sequence of their change during the movement of the control object. To confirm the hypothesis about the influence of the selected parameters, the method of a physical experiment was used. Determining the parameters of the model is relevant in solving problems of optimizing the motion model and developing this topic. The novelty of the study is determined by the absence of such algorithmic support in the literature, and the relevance is determined by the development trends of modern unmanned aerial vehicles.

T.A. Serebryakova, O.A. Solmina

Artificial Intelligence Technologies in Business Informatization

Keywords: business process; informatization; artificial intelligence; AI technologies; management decisions.

Abstract. The purpose of the study was to analyze the place of information technology in the optimization of control systems. The task was set from the standpoint of a systematic approach to determine effective informatization technologies as an integral part of the development strategy

of organizations. The necessity of transition to a new technological level in connection with the development of digital technologies and the departure of foreign IT suppliers is emphasized. The implementation of the import substitution policy and the promotion of innovative development is a key benchmark in the current conditions. The paper clearly presents the goals of using artificial intelligence as the most trendy and promising tool for improving the efficiency of an organization.

I.G. Stakhiv, Ye.M. Bashirova

Diagnostics of Insulation Overvoltage Limiters by the Method of Isolation of Diagnostic Markers

Keywords: markers; step voltage; dielectric.

Abstract. To make a decision on the suitability of overvoltage limiters for further operation, it is necessary to develop appropriate criteria based on the application of all available test and measurement methods. The appearance of an instrument base with advanced diagnostic capabilities allows you to obtain a number of additional variables. Based on the analysis of these variables, it is possible to identify insulation defects of overvoltage limiters.

E.V. Tkachev, V.Yu. Belash

Designing a Mobile Application for Calculating Car Costs

Keywords: car; design; interface; information technology; mobile application.

Abstract. The article discusses the process of designing a design for a mobile application for calculating car costs. The purpose of the study is to determine the requirements for the design of a mobile application for motorists, which must be taken into account when designing. The hypothesis of the study lies in the dependence of the popularity of the created mobile application on the design of the user interface. Mobile applications-analogues of Drivvo and My Car were studied, their advantages and disadvantages were revealed. The requirements and recommendations for creating a mobile application interface have been developed. The research methods are analysis of the literature on the development of mobile applications, idealization and formalization of ideas about the implementation of software products. Achieved results based on the conducted research, a prototype design for its own application has been developed.

A.Yu. Tumanov, V.P. Vyaznikova

Improving the Quality of Metrological Support of Automated Mobile Radiation Monitoring Systems

Keywords: selection of measuring tools; metrological support; systems.

Abstract. The aim of the study is to improve the quality of metrological support for automated mobile radiation monitoring systems. The criteria for the selection of means for measuring the ambient equivalent dose of ionizing radiation and the chemical composition of radionuclides are revealed. The hypothesis of the study is based on the assumption that the criterion selection based on the methods of operations research allows you to reasonably choose a measuring tool and thereby improve the quality of metrological support for automated mobile radiation monitoring systems. A multi-criteria selection of measuring instruments by methods of operations research was carried out.

Water-Based Dewatering System for Drilling Fluids to Reduce the Negative Effect on the Environment When Drilling Wells

Keywords: dehydration; drilling mud; flocculation; coagulation; drilling; ecology.

Abstract. The oil and gas industry has been and remains a key player in the global energy market.

One of the main processes in this industry is drilling.

Since drilling rigs use slurry barns to dump drilling products (spent drilling mud, sludge and other hydrocarbon production products), this approach has a number of disadvantages, such as the risks of damage to the insulation of the barn, overflow over the edges of the barn, evaporation of toxic substances through the open surface of the barn, which in turn leads to environmental pollution. Wednesday.

A closed-type system is a way to reduce the level of pollution. The classical scheme of drilling mud circulation is as follows: the prepared drilling mud from the tanks is pumped into the well to flush the drill bit, then a mixture of drilling mud and drilled rock rises through the annulus to the drilling rig cleaning system. In turn, the cleaning system consists of a number of tanks, 2–3 vibrating screens, 1a matrix and a centrifuge. This complex allows you to reuse the solution and thereby reduces the volume of drilling mud for disposal. However, when drilling a well, different types of drilling fluids with different physical properties and chemical compositions are used. Thus, there is a problem of storage and transportation of spent mud, since from one drilling interval the volume of spent drilling mud is usually 100–500 m³.

This paper describes the device of the Russian Dewatering system for processing spent drilling mud. This installation is an effective solution for the processing of the solution, reduces environmental damage and saves money on the transportation of the spent solution. The product of processing is “fugate”, which in turn is harmless to the environment.

E.S. Kvas, V.P. Kuzmenko

Enhancing the Assembly Line Flexibility of Led Lamps Via Petri Net Analysis

Keywords: production line modeling; flexible production lines; LED lighting fixtures production.

Abstract. The research is aimed at the study the ways to increase the flexibility of the production line of household LED lamps by using the analysis of Petri nets. The study uses the Petri nets modeling approach, graphical and mathematical modeling tools. Model parameters were adjusted to simulate different production strategies, including sequential and parallel task execution. The novelty of this study lies in the application of Petri nets analysis to the LED lamp production process, taking into account the reorganization of production steps into grouped tasks to increase throughput.

T.G. Oreshenko, R.V. Romanov

The Development of a Method for Predicting Degradation of Solar Panels in Space

Keywords: power supply system; solar battery; photo converter.

Abstract. On modern spacecraft, power supply systems occupy up to 30% of the spacecraft itself by weight, volume and cost. Therefore, the problem of creating spacecraft power supply systems (hereinafter referred to as PSSs) is of paramount importance, its improvement can significantly improve the technical and economic indicators of the spacecraft as a whole.

In this paper, we consider the creation of a mathematical method for calculating the degradation affecting the volt-ampere characteristic of a solar battery during operation.

The Impact of External Physical Influences on the Accuracy of Readings

Keywords: external factors; physical impact; mechatronic module; robotics; remote diagnostics; collaborative robots.

Abstract. In the modern world, the 4th industrial revolution has ended, which is based on the processes of digitalization, informatization and robotization of all sectors of society. But, due to numerous factors related to the international situation and the low level of material and technical base, and differentiation between regions, there are problems in Russia with the development of operating standards for innovative equipment. Therefore, it is considered relevant to make the necessary clarifications on working with robotics. The purpose of the article is to consider the features of the influence of external physical factors on the operation and accuracy of readings of mechanical devices. The tasks are to consider the features of the regulatory and practical regulation of the operation of mechanical devices; to describe the algorithm for the perception of tasks by sensors; to give examples of the operation of sensors in the framework of the functioning of robotics. The hypothesis is the assumption that the main factor that has a negative impact on the operation of robotic equipment is the lack of normatively fixed operating conditions. The research methods are generalization of empirical data, modeling and analysis of practical research. In the results of the study, possible problematic points are considered. In conclusion, proposals are made to optimize the operation of mechanical devices.

M.Sh. Gatiyev, S.S. Mal'sagov, A.Kh. Tsechoyeva, M.S. Merzhoyeva

Increasing the Strength of the Car Brake Disc

Keywords: smoothing; brake disc; brake system.

Abstract. A good braking system is a guarantee of safety for all road users. Weak braking occurs due to wear of the brake discs. Drives have to work in extreme conditions, undergoing high temperature loads. Slow ineffective braking is easily noticeable at high speeds, vibration due to beating, which appears curvature, occurs due to heating of the discs, due to which it leads to curvature and uneven wear. In this case, the discs are subject to 100 % replacement. Resurfacing does not help. The authors attempted to describe the problem that arises during the operation of a domestically produced car. The article describes one of the methods for hardening machine parts.

I.V. Khramov, A.P. Mokhirev

Technological Process of Production of Soundproofing Wood-Based Panels

Keywords: wooden multilayer building block; wood panel; process technology; sound insulation.

Abstract. The aim of the study was to develop a typical structure of technological processes for the production of soundproofing boards. To achieve the goal, the following tasks were set: an analysis of the features of the production of wood-based panels was carried out and possible ways to improve their sound and thermal insulation characteristics were identified. The main research methods are analysis, synthesis and synthesis. The results are as follows a generalized structure of the technological process is proposed and the possibility of further improvement of building materials is justified by manufacturing a wooden building panel from edged dried cross-arranged lamellas and including a cellular structure in the building panel of a wooden lamella.

Digital Transformations in HR-Management

Keywords: transformation; management; digital tools; management; global market; changes; personnel management; digital economy.

Abstract. The purpose of the article is to conduct a comparative analysis of the results and processes of digital transformations in the field of personnel management. The objectives of the article: to analyze the trend and problems of digital transformation of management, to study the forecasts of the consequences. The research hypothesis is as follows: the authors consider the genesis and interaction of global HR problems at the present stage. The research methods are qualitative and quantitative analysis of existing sources on the topic under consideration, logical methods, as well as an information retrieval method. The research results are as follows: in conclusion recommendations are provided with which you can quickly adapt to industry trends, train existing employees and hire suitable candidates for dynamic digital structures.

M.K. Yemel'yanova, T.V. Yevdokarova

The Research on Motives for Choosing a Profession of High School Students in a Rural School

Keywords: choice of profession; motive; motivation; career guidance; self-determination; profession; types of motivation; professional motivation; conditions.

Abstract. The main purpose of the study is to identify the level of formation of motives for choosing a profession among high school students. To achieve this goal, the following tasks were set:

- 1) to analyze the scientific and theoretical literature on the research topic;
- 2) to reveal the age characteristics of high school students.

As a hypothesis of the study, it is assumed that the formation of motives for choosing a profession among high school students will be effective if the individual capabilities and needs of each student are taken into account; conditions for the implementation of a career guidance program have been created; systematic purposeful work on vocational guidance was organized at the school.

The methods of theoretical research were analysis, synthesis and generalization of scientific sources on research issues. Among the empirical methods, tests and questionnaires, standardized and adapted to the objectives of the study, were used, in particular, the method of R.V. Ovcharova "Motives for choosing a profession".

Ye.G. Klikushina

Land Planning Works in Complex of Anti-Erosion Measures

Keywords: restoration of disturbed lands; disturbed land resources; agriculture; planning work; the cost of planning works; soil erosion.

Abstract. This study was conducted to determine the place and role of land planning works in the system of restoration measures for the disturbed lands, to estimate their effectiveness and accessibility degree for application in economic management of agricultural enterprises. The main task of the study was to compare the main groups of basic elements of the anti-erosion measures system. Assuming that land planning is available for implementation both in organizational and material terms, in the course of the study, the author identified the need for a comprehensive assessment of the costs of these works. As well as the necessity to conduct analytical studies, to study market offers in various regions of the country, based on a standard estimate of land planning both as part of the first group of activities in areas with a small slope, and as part of a set of measures to eliminate erosion in areas with a large slope. The development of such an estimate also identified as an independent direction for further research.

The Use of Digital Technologies in Management

Keywords: digital technology; management; business; efficiency; costs; personnel management; digitalization.

Abstract. Modern economic development is based on the active use of digital technologies in all branches of economic activity without exception. Advanced developments make it possible to optimize costs, accelerate business processes, transfer huge amounts of data, and significantly increase the efficiency of production activities. Active digitalization is taking place in the domestic economy. A modern company that does not use digital technology in its activities significantly slows down its development and is inferior in the level of competitiveness to its opponents. The purpose of this article is to consider the current trends in the use of computer technologies in the management of a modern organization. The objectives of the study were to describe the process of digitalization of the domestic economy, to highlight the main advantages and use of digital technologies in personnel management, to talk about the use of information technologies for distance learning and staff development, and to confirm the hypothesis put forward, according to which the introduction of digital technologies is an effective tool for developing the company's competitiveness. The authors come to the conclusion that the use of digital technologies improves the efficiency of the company.

J.A. Salavatova

Digital Profile as an Element of the Digital Economy

Keywords: digital economy; digital profile; digital footprint.

Abstract. This article is a continuation of research on the topic of staffing the digital economy and examines the essence and degree of knowledge of the digital profile in modern research. The paper considers the stages of interaction between users and organizations to obtain data from their digital profile, it is determined that the main goal of the digital profile is to improve the quality, speed of obtaining and connectivity of data. Hypothesis: the digital profile of individuals and legal entities is an indispensable element of the digital economy. The results are as follows: a review of the degree of knowledge of the digital profile in modern research, analysis of the current state, prospects for the development of the digital profile in Russia. The study used general scientific methods: analysis, synthesis.

P.O. Dudin, E.V. Sokolova, S.O. Medvedev

Content and Stages of Development of the Concept of Sustainable Development

Keywords: sustainable development; concept; principles; state of the environment; society.

Abstract. One of the main trends of the modern world is orientation to the principles of sustainable development. The purpose of the presented work is to study the content and stages of the development of the concept of sustainable development. The study confirmed the main hypothesis about the extreme importance and relevance of this concept for the current and future development of society. As a result of the study, it was found that it is necessary to develop the national economies of the countries of the world taking into account this global agenda. The main methods used are analytical (descriptive, comparative, formal).

S.M. Mal'tseva, D.M. Paramonova, S.A. Shigayeva, Ye.A. Ryabkova

Idleness as a Type of Earnings

Keywords: idleness; laziness; professions; study; earnings.

Abstract. The purpose of the work is to describe the types of professional activities that do not require much effort. The tasks are to define idleness, describe its differences from laziness, analyze the reasons, indicate existing professions perceived in society as idleness. The hypothesis is as follows many modern professions are perceived as "easy" work, but they are not. The paper provides examples of such professions, as well as those that are traditionally considered "easy" and unpromising. The research is based on methods of comparative analysis, methods of analogy, synthesis and systematization.