ABSTRACT AND REFERENCES

CONTROL SYSTEMS

VISUALIZATION OF IMPLEMENTATION OF ADVANCED TECHNOLOGIES IN SPACE 4D (p. 4-11)

Vitaly Borovik, Vitaly Borovik, Yury Prokopenko

Graphical interpretation of the Cobb-Douglas production function (PF), which allows to visualize the combined influence of the main production factors was taken as the basis of the research. A mathematical model of the organizational-economic system management in conditions of scientific-technological progress, in which implementation is seen as an algebraic introduction of the resource differential system to PF is proposed. The model allows to calculate the implementation efficiency of advanced technology for real organizational-economic system, production activity of which, in addition to quantitative parameters, is also expressed by qualitative characteristics - production resource usage intensity.

Based on the Lorentz transformation, as an analogy for Minkowski metric of orthogonal transformations, generalizing the concepts of motion in Euclidean space, an attempt to graphically present management under STP in four-dimensional space that unites the physical three-dimensional space and time was made. It is shown that a clear understanding of the management processes in implementing new technology in 4D space plays an important role not only due to great probative value, but also for understanding, evaluating and finding the optimal management.

Keywords: management; implementation; four-dimensional space; production function, Lorentz and Minkowski transformations.

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ADDITIONAL SEALINGS OF TRAFFIC FLOWS ON APPROACHES TO THE ADJUSTABLE CROSSROADS (p. 11-17)

Artem Mezhenkov

The assigned tasks of formalizing the process of forming additional sealings of traffic flows on approaches to the adjustable crossroads by the corresponding traffic light object operation in the adjustment mode, as well as by the corresponding traffic light object operation in the yellow blinking mode or at switched-off object are solved in the paper. Formulas for general corrected value of the amount of sealings on the approaches to the crossroads with traffic light adjustment during the day by the relevant traffic light operation modes and adjustment phases are obtained. The above allows quantitatively assess negative effects of sealings of traffic flows as a result of traffic light object operation. The results of the work allow further development of theoretical principals concerning evaluation and corresponding reduction of adverse effects during traffic light operation at the crossroads. Synthesis of kinematic criteria for evaluating traffic safety at respective crossroads is proposed. The criterion will allow to substantiate appropriate measures on improving traffic safety within the traffic light adjustment at the crossroads.

Keywords: traffic flow, crossroads, additional sealing, traffic light object, restrictive signal.

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FORMALIZATION OF CHARACTERISTICS OF INTERACTION OF VEHICLES AND PEDESTRIANS IN CONFLICT AREAS IN THE CROSSROAD TERRITORY (p. 17-23)

Nataliy Sokolova

Based on the analysis of statistics of road traffic accidents in Ukraine at unregulated crossroads, the task on improving the methods for assessing the safety of unregulated crossroads taking into account qualitative accident rate indicators that characterize the severity of road traffic accidents was set in the paper. According to the analysis of the interaction between vehicles and pedestrians, the concepts of conflict area of interaction between traffic and pedestrian flows in the crossroad territory were introduced. Five specific

interaction areas were identified. For the corresponding conflict areas in the crossroad territory, formalization of the specified interaction between vehicles and pedestrians at the level of the characteristics of the interaction process in time within the day was held. It was proposed to reflect the interaction using the law of conservation of energy. In this regard, energy characteristics of interaction between vehicles and pedestrians in the corresponding conflict areas were synthesized by the proposed five types of interaction between traffic and pedestrian flows.

Keywords: traffic safety, traffic flow, pedestrian flow, unregulated crossroad, conflict interaction.

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ABILITY USINGOF UKRAINE TECHNICAL REGULATIONS CUSTOMS UNION 012/2011 (p. 24-28)

Valentin Tikhenko, Konstantin Mezhenkov, Tetiana Antonenko

In view of recent events that occur in relations between the two countries, Ukraine and Russia, the issue of maintaining successful economic positions of Ukrainian manufacturers of explosion-proof equipment in Russian-Ukrainian relations is becoming very important. The paper deals with current problems in the field of technical regulation, standardization, conformity assessment of explosion-proof equipment and removal of technical barriers to mutual trade in this equipment with the neighboring CIS countries. As a result of the study, a comparative analysis of existing technical regulations of Ukraine (TR 898) and Russia (TR CU 012/2011) was conducted, the main contradictions of these documents were highlighted and a reasonable assessment of the effects of using TR CU 012/2011 on alternative or non-alternative basis by Ukrainian business entities was given. The results are of practical importance and can be used for further in-depth study of the impact of technical barriers on business entities of explosion-proof equipment in Ukraine when using technical regulations of the Customs Union. The analysis and conclusions, presented in this paper are of interest of government and non-government agencies and organizations that deal with the above problem.

Keywords: explosion-proof equipment, directive, technical regulations, conformity assessment, standardization, certification, technical barriers.

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MODELS AND PROCEDURES OF INVESTMENT PROJECTS PORTFOLIO CONSTRUCTION BASED ON DYNAMIC APPROACH (p. 29-32)

Valentyna Moskalenko, Tetiana Zakharova, Andriy Kryvoruka

Functioning of the enterprise cannot be effective without investment activity. This paper examines the actual scientific problem of developing models and procedures of investment projects portfolio formation in the context of investment decision support, taking into account the impact of many external factors and changes in investment policy. The paper shows the investment portfolio formation for a specific investment policy based on different approaches. These technologies are implemented using dynamic and Boolean programming. Dynamic portfolio formation technology, which allows to plan investment resources at both tactical, and strategic level, is proposed. Projects for each time interval are selected according to the risk and return level of investment policy. Then, iterative process of portfolio formation begins. Optimal portfolio is formed on the first interval, where return serves as a criterion. All projects that were not included in this portfolio may be transferred to the next interval in the case the client agrees to get investments on the next time interval. The client can also reject investments. In this case, the projects that were not previously included in this interval may enter the portfolio instead of rejected. The iterative process ends when the selected investment policy is implemented. Based on the data of mathematical models and technologies, the decision support system in the form of program solutions, which allows to make scientifically-grounded decisions by forming the corresponding investment portfolio will be implemented. This system can be integrated into a corporate management system of the company, engaged in investment activities.

Keywords: investment project, decision-making, investment policy, optimization problem, dynamic portfolio.

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LOGISTIC PRINCIPLES OF MANAGEMENT BY THE PUBLIC PASSENGER TRANSPORT SYSTEM (p. 33-37)

Ekaterina Vakulenko, Viktor Dolya

The analysis of basic logistic principles, which can be applied in the development and management of the route system of public passenger transport: quality control principle, total costs principle, system stability and adaptability principle is performed in the paper. The logistic principle of the system stability and adaptability, which lies in the flexibility of public passenger transport system, its maneuverability is considered. The methodology for determining the failure probability in the tramline operation, caused by the vehicle failure and taking into account the traffic jam probability on the route is given. The methodology is based on analytical probabilistic models. The obtained probability values indicate that at an increase in the failure probability of the i-th vehicle, the failure probability of the route grows much faster with raising the number of vehicles, operating on the route. In view of the trend of development and implementation of logistic principles in public passenger transportation organization, within the logistic principle of the system stability and adaptability using the given methodology in the formation or improvement of the route network provides the possibility of rapid re-routing, assigning temporary routes, prompt intervention in the transportation process in order to meet transportation needs of the population. Also, the obtained results are useful in the organization of public electric transport routes, which requires constant intense passenger flows and developed transport communications. However, it should be noted that the drawback of the methodology is that the systematicity principle of public passenger transportation is not taken into account, and the failure probability of routes of other transport modes is not considered, which is the subject of further researches.

Keywords: public logistics, logistic principles, public passenger transport, route system, probability, route.

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ROBOT VOICE CONTROL GRAMMARS DEVELOPMENT (p. 38-42)

Anatoliy Andrusevich, Svitlana Milyutina, Victoriya Nevlyudova

Application of industrial robots can improve the production flexibility. However, in this case, there is a need to write control programs. Herewith, we should maximize the facilitation of this process, the introduction of voice control can be one of these ways. The basic principles of forming robot control grammars are presented. The feasibility of developing the proposed grammars is explained by the need to formalize the industrial robot control language, which is close to natural. The sequence of actions that allows implementing the voice control was developed. The key (pre-control) words and allowable sequences of voice command input were defined. The basic characteristics of the RM-01 robot, as well as the movement restrictions were considered. The basic methods and properties, implemented by the program are given. The XML-file, containing the library of robot control words, its structure and principles of creation, were considered. Thus, the developed library provides the possibility of its expansion for adapting to other models of industrial robots.

Keywords: grammar, voice, control, recognition, speech, robot, library, team, manipulator, link.

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MORE EFFICIENT USE OF OPEN WAGONS BY IMPROVING VIBRATION HANDLING MACHINES (p. 42-47)

Yevhenii Povorozhenko

Scientific and practical problem of increasing the efficiency of unloading technology of bulk cargo from open wagons by improving unloading machines is solved in the paper.

Based on the analysis of parameters that affect the operational efficiency of open wagons and comparison of existing technologies and technical means for unloading bulk cargo from open wagons it was found that technology with using overhead vibrating machines has become the most prevalent. However, these machines do not meet current production requirements concerning performance and preservation of rolling stock.

Based on the slope stability theory, correlation between vibration body accelerations of the open wagon and its unloading duration is determined. New mathematical model of vibration unloading of open wagons taking into account the change in weight of cargo residues and finite-element model of the "open wagon -vibromachine – cargo" system, which allow at the design stage to assess its performance and examine its impact on the durability of open wagon body elements are developed. Rational values of driving force frequency are found, which promotes increasing the unloading efficiency of open wagons and ensures the preservation of open wagons.

Experimental studies have shown the adequacy of theoretical research in practice. The practical recommendations, aimed at reducing the circulation of rolling stock by increasing the efficiency of vibration unloading of bulk cargoes from open wagons are proposed. The research results are implemented at the state-owned company "Vinnytsyatransprylad".

Keywords: open wagon, bulk cargo, vibration, unloading, mathematical model, finite-element model.

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JUSTIFICATION OF OPTIMAL TECHNOLOGICAL PARAMETERS OF extraction OF GRANITE BLOCKS ON THE BASIS OF JOINTING INDICATORS (p. 48-52)

Volodymyr Levytskyi, Ruslan Sobolevskyi

The algorithm of forming technological complexes at facing stone quarries was elaborated. It includes designating structural-homogeneous and structural-technological quarry zones and determining the optimal technological parameters for them. The dependence of stone losses while preparing a monolith for separating by diamond-yarding units on the size of the monolith was studied in order to establish the main factors, affecting the coefficient of losses and estimate optimum length and height of the monolith. It was found that with the height and length of the monolith amounting to less than 2 m, the loss coefficient value increases drastically.

Basing on the initial data of the spatial orientation of joints and the dependencies, set by the criterion of minimizing block production losses, for the conditions of the Nataliivskiy granodiorite deposit the optimal technological parameters of blocks extraction were identified as follows: the bench height equals to 5.815 m, the monolith width is 1.34 m, the length amounts to 5 m.

The obtained results allow optimizing the structural-technological career area parameters and increasing the production of high-quality commercial output.

Keywords: trade granite block, quality management, jointing, height of bench, output of blocks.

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ANALYSIS METHODS AND MODELS OF CALCULATION OF PASSENGER CORRESPONDENCE (p. 53-57)

Andriy Bilous, Inna Demchuk

Forming the correspondence matrix of passenger movements from a mathematical point of view is one of the most difficult tasks in researches related to significant structural or parametric changes of urban network traffic flows. The methods of forming the passenger correspondence matrices were considered in the paper, their advantages and disadvantages were identified. According to the analysis results, the basic requirements for models of calculating the volume of correspondences of residents' movements in urban areas were established and using a fuzzy logic the models were properly selected.

As for the models using the fuzzy logic theory it was found that one of the "weak" points is the correct definition of membership function parameters. For solving the problem of setting appropriate parameters of the membership functions and their correction during the model application, it was decided to use a mathematical tool of heuristics of genetic algorithms. The paper is an overview and is intended to organize information about currently developed methods and models of calculating the volume of movement correspondences in urban areas.

Keywords: correspondence matrix, consumer demand for movement, models using fuzzy logic.

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