

## ABSTRACT AND REFERENCES

## CONTROL PROCESSES

### METHODS OF PRESENTING FORMULATED REQUIREMENTS TO THE INFORMATION SYSTEM AT THE LEVEL OF KNOWLEDGE (p. 4-11)

Maksym Ievlanov

The paper presents research findings on the methods of presenting formulated functional requirements to the information system at the level of knowledge. The approaches developed in the study are as follows: a method of presenting functional requirements at the level of knowledge of an individual participant of the automated process, a method of presenting functional requirements at the level of knowledge of the Consumer of IT services, a method of presenting functional requirements at the level of knowledge of the Provider of IT services, and a method of presenting functional requirements at the level of system-wide knowledge.

The developed methods allow automation of the processes of presenting and analysing functional requirements to information systems.

With the help of these methods, the task of matching the requirements of the Consumer with those of the Provider of IT services can be viewed as the task of creating a system-wide presentation of requirements at the level of knowledge. This considerably simplifies the solution of the problem of synthesis in the descriptions of the rational architecture of the information system.

The devised methods and the thereby resulting tools of developing information systems unify and simplify the processes of pre-surveying and designing information systems. This, in turn, helps reduce the cost and time of implementing IT projects for creation and upgrading of information systems. Moreover, the use of the developed methods allows the Provider to adapt previously obtained solutions to the peculiarities of the new requirements of the Consumer.

**Keywords:** information system, functional requirements, design patterns, frame, interface, connection.

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### DEVELOPMENT OF THE OPTIMIZATION MODEL OF PRODUCTION AND DELIVERY PLANS TAKING INTO ACCOUNT UNCERTAINTY FACTORS (p. 12-15)

Yulia Kurudzhi

A static model of joint optimization of the enterprise production plan and the delivery plan of finished products to a given set of consumers was developed and investigated in the paper. The model takes into account the random fluctuations of the line speed and demand for products.

The developed model describes the supply chain, considering the risk factors.

The required control parameters are the production volume of several types of products and volumes of transportation. The model is based on the known deterministic model of the production-transportation problem of linear programming.

As a result, the production-transportation type single-stage stochastic optimization problem was obtained, and its deterministic equivalent was built. The latter is a complex problem of nonconvex nonlinear programming, to solve which the first and second order optimization techniques are used.

The model constructed using the appropriate software can be used in the practice of logistics managers.

The results are the basis for further research and synthesis, for example, for building dynamic models of inventory management, taking into account internal and external uncertainty factors.

**Keywords:** supply chain, stochastic optimization, random demand, random line speed.

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#### AUTOMATED ANALYSIS OF ERGONOMIC MEASURES IN DISCRETE CONTROL SYSTEMS (p. 16-22)

Evgeniy Lavrov, Nadezhda Pasko, Anna Krivodub

The information technology for evaluation of working conditions in the human operator workplace and selection of a rational set of measures for the ergonomic quality assurance system was developed. The need for developments is caused by the increasing complexity of human activities in automated systems and low motivation of practicing managers in the system-ergonomic research. It was found that estimating the working environment factors in the workplace allows to quickly obtain integrated estimates of labor severity and reasonably recommend the ways to improve the economic efficiency of production. It is shown that taking into account the influence of the working environment factors can be accomplished by using correction factors for the initial data on the time and accuracy of certain operations. Using the technology of automatic reduction of the functional network, corresponding to the human operator activity algorithm allows to quickly obtain the necessary economic estimates of options to improve working conditions. Developments are useful to form decision support systems of managers or practicing ergonomists and provide a significant improvement of working conditions, operators' motivation and economic efficiency of production by increasing the accuracy and timeliness of the operating personnel activity algorithms.

**Keywords:** ergonomics, human operator, workplace, labor severity, activity algorithm, accuracy, timeliness.

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#### FORMALIZATION OF BASIC PATTERN MATCHING ALGORITHMS IN PRODUCTION SYSTEMS (p. 22-27)

Svitlana Shapovalova, Olga Mazhara

Currently, there are several models of formalization of production systems. The formalization in terms of the first-order logic is the most universal. However, such formalization is not provided for all inference machinery in production systems. In particular, among the basic pattern matching algorithms, the generalized formal description was proposed only for the Rete algorithm. In the paper, the formalized description of the production system and basic matching algorithms (Rete, Treat) for further resource intensity assessment at the design stage was presented in a single format. A formal presentation of the compilation and implementation of the data flow network of the Treat algorithm was proposed. Based on the proposed formalization, the memory consumption calculation model for the Treat algorithm was extended due to taking into account memory consumption to preserve the conflict set and agree variables in the terminal vertices of the data flow network. In the future, the proposed single format of the presentation of the basic algorithms can be used for the resource intensity assessment of the Treat algorithm based on the mathematical models proposed for the Rete algorithm.

**Keywords:** pattern matching, formalization, Rete algorithm, Treat algorithm, production system, inference.

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## EVALUATION OF FREIGHT FORWARDER RISK TO TRANSPORTATION MARKET ENTRY (p. 28-31)

Vitalii Naumov

Consideration of risks in managing freight forwarding processes allows decreasing potential losses as the result of market situation change for logistics system elements, which are involved in delivery process. Existing approaches to freight forwarders risks estimation are usually not based on technological process model; they take into consideration external factors, such as legal framework, traffic conditions, logistics system structure and others. In the paper in order to evaluate freight forwarder risk to entry the transportation market, a simulation model of servicing by the forwarding company of requests flow has been developed. Regression model, obtained on the basis of simulation results, allows to estimate numerically a measure of freight forwarder risk without the simulations of the process of requests servicing. Provided results of research allow to state, that forwarding company risk to entry the market monotonically increases with increasing of average requests interval in the serviced flow and monotonically decreases with increasing of the tariff on services of a freight forwarder. Research results should be considered while managing the process of freight forwarders entry to new markets.

**Keywords:** freight forwarder risks, transportation market, simulation experiment algorithm, software implementation.

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## ANALYSIS OF CHANGES IN FUNCTIONAL STATE OF BUS DRIVER IN MOUNTAIN TRAFFIC CONDITIONS (p. 32-37)

Nikola Zhuk, Taras Postranskyi

The functional state of the driver is one of the sources of information about the body readiness to perform tasks. It affects the traffic safety of all participants in this process. The problem acquires significant importance in passenger transportation by route vehicles in difficult traffic conditions. For this, a research of changes in the functional state of the drivers who drove the buses with different performance characteristics on roads in mountainous areas was carried out. This is caused by the fact that such traffic conditions complicate the driver's work. The research results show the influence of the route vehicle characteristics and conditions on the functional state of the driver. The index of activity of the driver's regulatory systems during long work can grow and reach 9 points. In this case, the body is in a state when adaptive and protective mechanisms can not cope with the load and can not react in time to the impact of external factors. Upon processing statistical data of research results, a pattern of change in the index of activity of the driver's regulatory systems depending on the mountain traffic conditions was revealed. Accordingly, the formula for determining the recommended driver's work duration was proposed. Using the influence factors of specific power of the route vehicle and the level of congestion, it is possible to take into account the influence of these factors on the functional state of the driver when developing the driver work schedules.

**Keywords:** functional state of driver, index of activity of regulatory systems, mountain traffic conditions.

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## FORMALIZATION OF THE TECHNOLOGY OF ARRANGING TACTICAL GROUP TRAINS (p. 38-43)

Tatyana Butko, Andrii Prokhorchenko, Andrii Kyman

The study suggests an improved procedure of correcting train formation plans (TFPs) on the basis of calculations on the agreed network arrangement of tactical group trains. Our aim is to improve the Ukrainian technology fortactical acceleration of long-distance and low-capacity train streams that do not meet the current TFPrequirements. The problem can be solved by means of the suggested formalized technology of correcting TFPs on the basis of arranging tactical group trains. The devised mathematical model allows selecting a reasonable route for arranging groups of wagons into agreed group trains with variable combinations of wagon groups within the network. The mathematical model belongs to integer linear programming tasks and can be solved with the help of the genetic algorithm. The suggested approach allows an effective distribution of work between technical sorting stations of the railroad network and ensures timely delivery of cargoes to the customer at the agreed time.

**Keywords:** railroad transport, tactical management, train formation plan, train stream, group train, genetic algorithm.

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## SOLVING A TASK OF THE PROJECT MANAGEMENT METHODOLOGY SELECTION BASED ON THE PROJECT SCOPE OPTIMIZATION

Igor Kononenko, Anna Kharazii

The paper deals with the task of the project management methodology selection. Using a particular management methodology may influence the basic project characteristics, namely, implementation time and cost, quality of the project products or stages, risks associated with the project implementation, towards both decrease and increase of these characteristics. For the project management methodology selection, the method based on the project scope optimization was applied, for the management of which the considered methodologies are used. The problem of multi-criteria project scope optimization to create a computer program «ForPlan» using two alternative management methodologies is solved. The calculation is performed using «ScopePro»

software, designed for solving the task. The optimization results, which allow to determine the way the application of the Scrum or SrystalSlear methodologies affects the above characteristics for the same project were given. Further, an analysis of the resistance of the results to changes in the original data based on the Monte Carlo method is carried out.

**Keywords:** project management, methodology selection, scope optimization, Scrum, SrystalSlear, resistance.

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## DEVELOPMENT OF CONCEPTUAL FRAMEWORKS FOR INTELLIGENT MANAGEMENT OF SUPPLY AND DEMAND IN THE LABOR MARKET OF INFORMATION TECHNOLOGY SPECIALISTS (p. 53-67)

Masuma Mammadova, Faik Ramiz Mamedzade

A comprehensive analysis of the labor market of IT specialists was performed, and conceptual frameworks of intelligent management of the latter were proposed. The concept of «intelligent management of supply and demand in the labor market of IT specialists», which lies in making the best management decisions on minimizing the imbalance between the supply and demand of IT specialists was introduced. The preconditions that underlie the research methodology of the labor market of IT specialists were determined, and the urgency of a systematic approach to individual labor market segments was substantiated. The basic structural components of a conceptual model of the intelligent management of matching supply and demand of IT specialists, determined by the demand for IT personnel through requirements for IT specialized vacancies, supply of IT specialists with a personalized intellectual capital, mechanisms and tools to assess the consistency degree of supply and demand vectors and support for the development processes of control actions for matching supply and demand of IT specialists in the labor market were highlighted. The composition was determined, and generalized model of the intelligent management system of the IT labor market was proposed, a general problem formulation of matching supply and demand of IT specialists was given. The classification of the indicators, features and factors that characterize the supply and demand of IT specialists, based on the author's interpretation of the intelligent human resource management in the IT sector, the specifics of the IT industry, task context and invariant for specialists with various training profiles was carried out. The information model of the dynamics of the aggregate supply in the market of IT specialists, reflecting the inflows and outflows, was proposed. The transactional model of the intelligent management system of the labor market, allowing to describe the interaction of demand and supply vectors of IT specialists in a given time interval and sources of resource flows was designed.

**Keywords:** labor market of IT specialists, supply, demand, intelligent management, intelligent management concept.

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