



INFORMATION TECHNOLOGIES

DOI: 10.15587/2312-8372.2019.159210

IMPROVEMENT OF THE ENTERPRISE INFRASTRUCTURE EVALUATION METHOD

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The object of research is the enterprise infrastructure. The main task of enterprise infrastructure is ensuring the availability of IT services and software for users and support business growth. The main disadvantage of the existing process of evaluating the infrastructure of an enterprise is identification of its main components. One of the most problematic places is the evaluation of the enterprise infrastructure to determine the impact of the introduction of a new IT service in a context of continuous changes in functional requirements of end-users.

Based on the results of the analysis of the infrastructure evaluation problems and the existing variants of the term «enterprise infrastructure», the main elements of the enterprise infrastructure are identified. It is proposed to define the infrastructure of the enterprise as a set of interconnected IT services, information and communication technologies integrated by the computer network of the enterprise.

In the course of the research, the analysis of the basic methods of evaluating the infrastructure of the enterprise was carried out, their advantages and disadvantages were determined. As a result of the analysis of the enterprise infrastructure evaluation process, an improved method for evaluating the infrastructure of the enterprise was proposed.

The proposed method, in contrast to the existing ones, combines quantitative cost evaluation and a qualitative evaluation of the components of the updated infrastructure of the enterprise, allowing a comprehensive evaluation of its infrastructure and formulating recommendations for the application of the selected IT service.

The advantage of the proposed method is that it provides the opportunity to form a preliminary evaluation of the planned changes in the infrastructure of the enterprise and thus refuse to make changes in the event of their low efficiency. It is noted that any modification of the infrastructure of an enterprise leads to a change in the indicator of its quality evaluation. Consequently, the detection of the dynamics of the indicator of quality evaluation will allow controlling the quality of the infrastructure of the enterprise. The accumulated statistics makes it possible to identify trends and, on the basis of their analysis, make timely decisions about the need for changes in the infrastructure of the enterprise in order to adapt it to the new conditions.

The results of the enterprise infrastructure evaluation can also be used to develop management decisions for the development and improvement of the enterprise.

Keywords: enterprise infrastructure, complex evaluation, qualitative evaluation, enterprise infrastructure management expenses, introduction of a new IT service.

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DOI: 10.15587/2312-8372.2019.160205

DEVELOPMENT OF INFORMATION TECHNOLOGY FOR THE AUTOMATED CONSTRUCTION AND EXPANSION OF THE TEMPORAL KNOWLEDGE BASE IN THE TASKS OF SUPPORTING MANAGEMENT DECISIONS

page 9–14

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The object of research is the process of knowledge base (KB) constructing, which involves the development of a formal presentation of knowledge, knowledge extraction, verification of their consistency and inclusion in the KB. The implementation of such a process is a necessary condition to use KB in systems supporting management decisions at the tactical and strategic levels of organizational management. However, there is currently a discrepancy between the practical need for implementation, knowledge-based support for managerial decisions under uncertainty, taking into account the temporal aspect of managing action and also the possibilities of existing techniques and technologies of interactive and automated construction of the KB.

The analysis of the research object testifies to the possibility of automated construction of the KB to support managerial decisions using temporal dependencies. The latter can be obtained based on the analysis of the sequence of states corresponds to the behavior of an organizational system as an object of management. Temporal dependencies between states represent the knowledge of control actions that have been implemented in managing decisions.

The logical-probabilistic model of temporal knowledge representation is improved by taking into account the hierarchical description of the management solution context, which makes it possible to simplify the construction of this solution. The proposed model provides the ability to support a rational choice from a variety of admissible management decisions by the probability of transition to the target state of the control object.

The method of automated construction and support of the temporal KB based on the account of the attributive description of the control object state and the context of the management solution is improved. The method involves the rapid formation and verification of the logical-probabilistic representation of temporal knowledge to support management decisions.

The information technology of automated construction and replenishment of temporal KBs is developed. Technology combines the capability of generating representation patterns and semantic verification of knowledge. The verification is performed by a specialist in the subject area. The automatic construction of weighted temporal rules based on the detection of dependencies in known state sequences of the control object. This makes it possible to quickly identify the new temporal dependencies for the subject area and bring them to the KB after semantic verification by an expert.

Keywords: management decision, decision support, temporal dependence, temporal knowledge base.

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SYSTEMS AND CONTROL PROCESSES

DOI: 10.15587/2312-8372.2019.154561

OPTIMIZATION OF THE METHOD OF CONSTRUCTING REFERENCE PLANS OF MULTIMODAL TRANSPORT PROBLEM

page 15–20

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The classical transport problem is in determination of the optimal plan for the transportation of goods from the points of departure to the points of delivery, taking into account the criterion of the minimum cost of such transportation. Such a problem takes into account only one type of transport, which does not fully correspond to the practical needs of modern logistics enterprises. That is why the object of this research is the classical transport problem, the formulation of which takes into account the presence of several means of cargo delivery, namely: automobile, railway and water. This type of transport problem is defined as multimodal.

The implementation of the multimodal transport problem involves the use of various numerical methods and is carried out using software. In fact, the conceptual approach to its solution is a simple selection of possible results. Given the large dimension of the problem, such an approach can be extremely cumbersome, and therefore requires some improvement.

During the study, the method for constructing a reference plan for such a problem was optimized based on the criterion of minimizing the number of numerical iterations, and the advantages of the proposed approach compared to those already known were substantiated. The basis of the new approach is the previously known minimal element method, which is to be used to solve the transportation problem, and an analogy with the Steiner problem was drawn. The latter, in turn, made it possible to define a new approach as the Steiner method.

The research result is development of a general algorithm for the implementation of the proposed Steiner method. As an approbation of this algorithm, a model example is provided. It demonstrated the identity of the results of solving a multimodal transport problem using all the methods discussed in the article.

The development of new methods for the implementation of the multimodal transport problem will make it possible to construct efficient algorithms for solving more complex problems of transport logistics. The criterion for reducing the number of numerical iterations, used at all stages of the implementation of such problems, significantly reduces the time to search for their solutions.

Keywords: multimodal transport problem, reference plan, optimization criterion, business model.

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DOI: 10.15587/2312-8372.2019.155847

APPROVAL OF OPTIMAL PIPELINE'S CLEANING METHODS ACCORDING TO MULTIPHASE FLOW PATTERNS

page 21–30

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The object of research is gathering and transmission system of gas and gas condensate fields.

One of the major problem areas is the lack of an integrated approach and justification for choosing the optimal for pipeline cleaning methods (removing deposit) from the inner cavity of pipelines that form these systems. This leads to inefficient use of pipeline pigging equipment and significant operating costs without visible economic benefits. Based on analysis of gas-condensate life cycles, it is established that different stages of the field development are characterized by a proper gas-liquid flows pattern.

During the research, the relief characteristics of the flow and trunk lines, which transmit the gas-liquid flow with different gas contents, are investigated. Based on the analysis of the criteria characterizing the flow pattern, mathematical models of overall pressure drop on the rising and declining sections are presented. The determined pressure differences are formed according to different structures of motion of gas-liquid flows under the influence of hydraulic resistance of each of the studied sections.

The estimation of the hydraulic state of the system transporting a multiphase flow, based on a comparison of the actual measured pressure drop and its calculated value, is presented. By experimental researches it is established that the most dangerous factor in the operation of such systems is the possibility of slug moving when changing the baric regime of operation.

In order to increase the reliability and efficiency of pipelines operation, an algorithm for determining the structural form of motion and actual hydraulic state of the gathering and transmission system of different types of field is proposed. And a sequence of choosing the optimal method for pipeline cleaning is developed.

The proposed algorithm for choosing the best ways to drain liquid from the pipeline cavity will provide an opportunity to discard deliberately inefficient methods, as a result will save time and money for the Company.

Keywords: gas-liquid flow, transmission gas line, flow pattern, pipeline cleaning.

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DOI: 10.15587/2312-8372.2019.160522

RATIONALIZATION OF PORT INFRASTRUCTURE MANAGEMENT DURING ICE NAVIGATION

page 30–35

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The object of research is the management of the sea port infrastructure during the ice navigation period. One of the most problematic issues is the rationalization and effectiveness of ice posting. Based on statistical data, a significant decrease in cargo turnover in the ports of the Sea of Azov (Mariupol and Berdiansk (Ukraine)) is observed throughout the ice period. A study is conducted of the need to use analysis and forecasting of seasonal processes in the management of the production activities of seaports, using statistical data, to determine the dynamics of the turnover of seaports during the ice period. On the basis of statistical data analysis, the concept of ice formation seasonality in the Sea of Azov is formulated.

In the process of research is given the definition of the concept of seasonality factor as a category, expressed in the form of oscillatory

processes. And also an approach to the formation of an information base is developed that takes into account various forms of the port's production activities in ice conditions that meet the requirements of continuous planning and regulation of the port. A verbal algorithm for predicting the state of ice cover for the formation of convoys for the purpose of statistical forecasting, including all stages of processing time series, is proposed and developed. As a result, a significant decrease in the port turnover during the ice period is proved and ways to increase the capacity of waterways during the ice period are proposed. According to the authors, with the help of the seasonality factor and ice formation prediction based on the verbal algorithm, it is possible to reduce the costs of using an icebreaker during ice navigation. It is assumed that the decrease of icebreaker's voyages can be reduced from 10–15 to 4–5, which in turn will significantly reduce the port costs for the maintenance of the icebreaker and increase the performance of the ports during ice navigation.

Keywords: seaport infrastructure management, increase in cargo turnover, seaport, ice navigation.

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DOI: 10.15587/2312-8372.2019.157602

RESEARCH OF THE OF IDENTIFICATION ALGORITHM OF CONTROL OBJECT OF SECOND-ORDER LINKS WITH A DELAY TIME

page 35–43

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The object of research is the optimal controller settings and transient quality indicators. One of the most problematic places is that modern technological processes are complex control objects, when designing automation systems, it becomes important to identify the control object and calculate the controller settings and optimize them. Optimal controller settings will ensure the highest possible product quality in the conditions of this technology and its minimum cost with a given production volume. Determining the optimal setting parameters of the controller by conducting an experiment at the facility itself can lead to a loss in the quality of the finished product, damage to raw materials, and catalysts. The calculation algorithm is implemented using the «Maple» software package.

In the course of the study, an algorithm for identifying control objects with different types of transients by second-order links with a delay time was proposed and investigated. In the course of the study, on the basis of the transfer functions of equivalent objects thus obtained, the settings of the P, PI and PID controllers (proportional, proportional-integral, and proportional-integral-differential) are found using the triangle method, the sustained oscillation method (Nicolas-Ziegler method) and using the proposed algorithm. These settings are intended for automatic control systems. A comparative analysis of the quality indicators of transient processes of the studied automatic control systems with the settings obtained by different methods. According to the results of a comparative analysis, it is concluded that the found parameters of the controller according to the proposed algorithm significantly improved the dynamic properties of the system (overshoot, regulation time, static and dynamic errors). An algorithm for searching for controller settings is proposed and investigated with the introduction of a restriction on the overshoot of the transition process, which also shows a positive result. The identification error does not exceed 3 %, which is quite acceptable for calculations of this type.

Keywords: second-order link, controller settings, regulation time, identification algorithm, transient process, delay time.

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DOI: 10.15587/2312-8372.2019.158903

SYNTHESIS OF TOWED UNDERWATER VEHICLE SPATIAL MOTION AUTOMATIC CONTROL SYSTEM UNDER UNCERTAINTY CONDITIONS

page 44–51

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The object of research is the towed underwater vehicle (TUV) spatial motion, operating as part of the towed underwater system (TUS). The TUV structure does not contain any propulsive devices; it is driven to the motion by the tugboat through the cable-tug. The task of controlling the TUV is provision of the desired dynamics of its translational motion. Manual control mode allows performing only short-term missions and does not exclude the occurrence of operator errors during control. To perform long underwater missions, it is necessary to use automated TUV.

For the synthesis of automatic control system (ACS) controllers, the method of minimizing local functionals is used. It allows getting control laws without information about the structure and parameters of the mathematical model of the control object. To study the synthesized ACS, a simulation method using computer simulation is used. It allows assessing the ACS quality without significant financial costs necessary for the marine natural experiment.

The ACS of TUV spatial motion is synthesized, it provides sufficient accuracy of control of the vertical and lateral coordinates of the TUV under uncertainty conditions. For its synthesis and operation, information about the structure and parameters of the mathematical model of the control object is not required. The control law, on the basis of which ACS controllers are synthesized, does not contain information on derivatives of a controlled variable. Therefore, the feedback loops of the synthesized ACS have a simple structure compared to the ACSs synthesized using the well-known methods that use the coordinates of the object's phase space.

The dynamics of the operation of the synthesized TUV spatial motion ACS was studied at various towing speeds. The duration of the transient processes from the moment the ACS exits the saturation zone to the moment the control error falls within the permissible range and the control accuracy are quite satisfactory. In comparison with the underwater vehicles known spatial motion ACSs, the synthesized ACS does not require a mathematical model of the control object for its synthesis and operation.

Keywords: towed underwater vehicle, automatic control system, spatial motion, uncertainty conditions.

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REPORTS ON RESEARCH PROJECTS

DOI: 10.15587/2312-8372.2019.160382

METHODOLOGICAL PROVISION OF HUMAN RESOURCES MANAGEMENT IN A MULTI-PROJECT ENVIRONMENT

page 52–54

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The object of research is the processes of human resource management of projects in a multi-project environment. The studies are based on the use of a combinatorial-logical approach to the construction of formal models for the formation and functioning of project teams in a multi-project environment, a stakeholder-oriented approach to the formation of resource requirements, and a donor-acceptor approach to the distribution of resources between projects. The main hypothesis of research is the assumption that the effectiveness of project management depends on the effectiveness of human resource management of projects and programs. This can't be achieved without taking into account the existing resource constraints and requirements that are determined by key project stakeholders. The issues of creating a methodological support for human resources management of forming adaptive teams in a multi-project environment are considered. The interrelation of the proposed methodology of project-oriented resource management for the formation of adaptive teams in a multi-project environment with modern approaches to human resource management is shown. A conceptual model of project-oriented resource management of the formation of adaptive teams in a multi-project environment is developed. A method of forming resource requirements is proposed, based on an analysis of stakeholder interest in human resource management processes, taking into account the loyalty of interested parties. The features of the process of forming requirements for the project team are considered. To reduce the complexity of the task of forming an adaptive team, it is proposed to carry out a number of checks. It is necessary to ensure the consistency of the requirements of the stakeholders, the compliance of the level of competencies of applicants with the required, the initial verification of reserve factors, the check for the presence of prohibited combinations and the initial analysis of the matrix of applicants. An example of the formation of a team with given

restrictions is considered. Restrictions are the level of competence and cost. The application of the proposed approach allows to build a project team with given functional requirements, possessing the maximum level of competence at the minimum cost of the team. The increase in the efficiency of the project team formation process is shown due to the complex application of the developed methodological support for human resource management of projects in a multi-project environment.

Keywords: project management, multi-project environment, project team, project stakeholders.

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