

ABSTRACT AND REFERENCES

INFORMATION TECHNOLOGY. INDUSTRY CONTROL SYSTEMS

DOI: 10.15587/1729-4061.2017.108556

DEVELOPMENT OF A MODEL FOR DETERMINING THE ALIGNMENT OF IT-SERVICES OF THE INFORMATION SYSTEM WITH THE END-USER REQUIREMENTS (p. 4-9)**Viktor Levykin**Kharkiv National University of
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Issues of determining an alignment of the IT-services of the information system of an enterprise with the functional end-user requirements are considered. Such alignment is established for the information systems with service-oriented architecture. A description of relationship between a set of IT-services and the set of requirements is considered to be extremely difficult. That is why in order to solve this problem, it is proposed to use a categorical apparatus.

In the work, models of the structure of IT-services and the structure of end-user requirements were developed. We defined structured sets and representations, which form a mathematical model of the structure of IT-services of an enterprise information system. Functionality of the morphisms, describing relationships between objects in a category of IT-services, was confirmed by commutative diagrams. To determine a category of the end-user requirements, the sets of objects and corresponding morphisms were assigned. The objects of end-user requirements include: a set of requirements from an enterprise, a set of requirements of subdivisions, a set of personal requirements by particular employees of the enterprise.

The categories of IT-services and end-user requirements are described in the form of structured sets and morphisms. Relationships between the introduced categories are described by the appropriate functor. Functionality of relationship between a category of IT-services and the category of end-user requirements is explained by the alignment of selection of IT-services with the implementation of a specific list of functional requirements. Implementation of such alignment is carried out using the introduced morphisms, which can be realized through visual models in the form of UML diagrams.

In summary, we obtained a categorical model for determining the alignment of IT-services of the information system with the end-user requirements.

Keywords: IT-service, theory of categories, end-user requirements, service-oriented architecture.

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DOI: 10.15587/1729-4061.2017.107512

DEVELOPMENT OF A METHOD FOR THE RECOGNITION OF AUTHOR'S STYLE IN THE UKRAINIAN LANGUAGE TEXTS BASED ON LINGUOMETRY, STYLEMETRY AND GLOTTOCHRONOLOGY (p. 10-19)**Vasyl Lytvyn**Lviv Polytechnic National University, Lviv, Ukraine
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We solved the problem of development of algorithmic software for processes of content monitoring for solving the problem of recognition of the style of an author of a Ukrainian text based on Web Mining and NLP technology. Decomposition of the method for recognition of the style of an author, based of analysis of the found stop words, was carried out. Specific features of the method include adaptation of morphological and syntactic analysis of lexical units to structural peculiarities of words/ texts in Ukrainian. It is syntactic words (stop words or anchor words) that are significant for an author's individual style, as they are not related to the theme and content of the publication. Recognition of the author's style is based on analysis of coefficients of lexical author's language: coherence of speech, lexical diversity, syntactic complexity indices of concentration and exclusivity for the author's fragment. They are used for subsequent comparison and determining of a degree of belonging of the analyzed text to a particular author. We studied internal "dynamics" of a text of randomly selected authors through analysis of coefficients of lexical author's language for the first k , n and m (without the title) words of the author's fragment and the analyzed one. The obtained results were compared. We obtained results of experimental testing of the proposed method for content-monitoring for determining and analysis of stop words in Ukrainian scientific texts of technical area based on Web Mining technology. It was found that for the selected experimental base that contains 100 works, the method for analysis of an article without compulsory initial information and list of references attains the best results by density criterion. It is achieved through learning of the system and by checking specified blocked words and specified thematic vocabulary. Testing of the proposed method for determining of keywords from other categories of texts – of scientific humanitarian area, belles-lettres, journalistic, etc. – requires subsequent experimental research.

Keywords: style of the author, statistical linguistic analysis, quantitative linguistics, author's attribution.

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DOI: 10.15587/1729-4061.2017.108569

DESIGNING A MODEL OF A DECISION SUPPORT SYSTEM BASED ON A MULTI-ASPECT FACTOGRAPHIC SEARCH (p. 20-26)

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A theoretical-multiple model, describing the composition and structure of a decision support system was proposed. The system operates based on a multi-aspect factographic search using simple methods of precedents detection, concerning different aspects of the problem to be solved.

The information technology of a multi-aspect factographic search was proposed. The technology allows us, on the basis of a primary query, to generate a query group in accordance with the aspects of the solved problem. In this case, subsets of aspect-relevant documents are separated. In each document, aspect-

relevant precedents are found. Then, the redundancy in search results is eliminated.

Effectiveness of the technology is ensured by two factors. This is the generation of a package of secondary queries on certain aspects, as well as sufficient completeness of a sample of documents for analysis. In addition, filtering of the content of each document on particular aspects allows guaranteed and even redundant detection of precedents, containing the facts that are required by the user. Redundancy of the search results is eliminated by the threshold processing of found textual fragments and by using importance weight factors of aspects.

The system minimizes actions of the user who does not need to generate multiple queries and take care of solving multi-aspect problems.

The information technology was tested on the example of a marketing task. Satisfactory assessment of completeness of search results was obtained both by aspects and, on average, by a task.

Keywords: decision support system, factographic search, set of precedents by aspects.

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DOI: 10.15587/1729-4061.2017.108531

SYNTHESIS OF ROBUST CONTROLLER WITH AN INTERNAL MODEL FOR OBJECTS WITHOUT SELF-ALIGNMENT (p. 27-33)**Taras Bahan**National technical university of Ukraine
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We examined the synthesis of an automated control system, which ensures the required operation quality of objects without self-alignment. As a result of employing as an optimality criterion a minimum of the H_∞ -norm of a transfer function of the closed system, we obtained structures of the controllers with an internal model for the objects without self-alignment of first and second order with a delay. It was found that such controllers had one adjustable parameter, which is a compromise between the quality and the robustness of the closed system. By changing this parameter, it is possible to receive different quantitative indicators of the system operation quality. We derived direct and unambiguous dependences of key quality indicators of the system on the parameter of H_∞ -controller. Results of these dependences are entered into a database. Based on these data, we created a program that determines such settings of the controller, which provide the required quality of a control system.

Therefore, it is possible to ensure with a guarantee maintaining the assigned quality indicator, which is convenient for practice, or achieve the desired combination of several quality indicators that is executed over the entire range of system operation, thereby ensuring its robustness.

Keywords: synthesis of controller, internal model, H_∞ -norm, integral object, quality indicators.

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DOI: 10.15587/1729-4061.2017.108574

MODELING OF DAILY TEMPERATURE MODE IN PREMISES USING A PREDICTIVE CONTROLLER (p. 33-41)**Petro Kachanov**National Technical University
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The goal of present work is to decrease electric power consumption in a building employing the developed control method that uses a prediction filter. To accomplish this goal, a model of the premises was constructed in the ANSYS Fluent software and a PWM predictive controller was synthesized. Modeling of daily state of the premises with maintenance of assigned temperature using the predictive controller, a two-position controller and a PID-control was performed. Results of modeling demonstrate that the use of predicting controller, taking into account parameters of the building, heating and ventilation systems, outdoor air temperature with maintaining minimal permissible operating air temperature in the premises at night, at weekends and on holidays, makes it possible to save heat resources. Refusal from continuous control and transition to the PWM predictive controller demonstrated a decrease in operating time of heating equipment by 2.3 times from 24 to 10.5 hours. The proposed control method showed the best controlling accuracy equal to 5 %, compared to a two-position control with hysteresis and a PID-control.

Keywords: simulation of thermal field of premises, predictive controller, pulse-width modulation (PWM), PWM control, heat supply to office building.

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DOI: 10.15587/1729-4061.2017.107349

A STUDY OF THE SPEED EFFECT OF MOVING SINTERING TROLLEYS ON THE PRODUCTIVITY OF THE CONVEYOR MACHINE (p. 42-51)

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The article provides results of research on the influence of the movement speed of sintering trolleys of a conveyor belt on the productivity of the conveyor machine. The movement speed of the sintering trolleys has been found to depend on the flow of raw pellets of the assembly conveyor of the conveyor machine; it affects the height of the pellet layer and leads to a change in the productivity of the conveyor machine. The study generates

a developed structural scheme for researching the regulation of the movement speed of sintering trolleys.

For the analysis of changes in the flow of raw pellets on the assembly conveyor, which affects the productivity of the CM, a mathematical model of the speed control system of the CM conveyor belt is constructed. For the system model, the force of resistance of the movement of the CM sintering trolleys is calculated with regard to the rolling friction in the running rollers of the sintering trolleys. This parameter is defined in the function of weight: empty trolleys, bottom bedding, raw pellets, and pressure of process gases and air. Another parameter required for the system model is the force of resistance of the sintering trolleys depending on the slip friction in the sealants. This parameter is determined by calculating slip friction in the lower longitudinal seals and when boilers were loaded onto the CM. The model takes into account the driving moment of ease of operation of the electric drive through the unloading part of the CM, the working moment on the driving stars of the conveyor belt, and the power of the electric drive of the belt of the sintering trolleys.

The research findings have determined the ways of changing the speed of the sintering trolleys, the height of the pellet layer, and the productivity of the CM in the function of the productivity of raw pellets on the assembly line.

The results of simulating the synthesized mathematical model of the system of controlling the speed of the CM sintering trolleys in the Matlab/Simulink environment are provided on the basis of the analysis of the freight flow of the assembly conveyor, which changes the productivity of the conveyor machine. It has been determined that efficiency of regulating the movement speed of the sintering trolleys depends on the technical parameters of the electric drive and the conveyor machine. The results of the simulation are given on the recommended limits for stabilizing the height of the pellet layer in the sintering trolleys and the maximum productivity of the conveyor machine.

It has been determined that the practical value of the obtained results lies in the possibility of using the proposed analytical dependencies to develop algorithms for an automatic control system for the heat treatment of pellets in the CM.

Keywords: conveyor machine, sintering trolleys, pellets, heat treatment, electric drive, speed regulation.

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DOI: 10.15587/1729-4061.2017.107542
**DEVELOPMENT OF THE METHOD OF QUASI-
 OPTIMAL ROBUST CONTROL FOR PERIODIC
 OPERATIONAL PROCESSES (p. 52-60)**

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It is possible to get the maximum financial possibilities from the results of the production structures functioning only if the operational processes of the controlled systems will operate in the optimal mode. For the practical implementation of this concept, it is necessary to use a production structure in which the issue of obtaining qualitative and quantitative parameters of the finished product is solved using separate systems: system of converting class and stock control system. Only in this case, the production structure has the necessary number of freedom degrees.

However, the freedom degrees increasing and the complex nature of the relationship between the system of converting class and the dual system of stock control leads to the need to implement search optimization methods. As a result, a long search for the optimum significantly reduces the efficiency of the technological process.

The method of the quasi-optimum control trajectory formation for the system of converting class is proposed.

The method idea is to connect the control of system of converting class with the stock level of dual system. In that case, when approaching the higher level of the dual system stocks, the CCS productivity increases as much as possible. This mode corresponds to its maximum efficiency. The production system control is robust at the same time.

The main advantage of this method consists is that the need of realization of long and resource-intensive search optimization method is excluded.

In the work, the mechanism, in the form of a mathematical expression, which connects the extreme values of the field of admissible controls of system of converting class with the minimum and maximum dual system stocks level is realized.

The simplicity of the method makes it possible to quickly practically implement it at any manufacturing enterprise.

Keywords: optimization of linked systems, quasi-optimal control, robust optimization, quasi-optimal control trajectory.

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DOI: 10.15587/1729-4061.2017.108572

DESIGNING AN AUTOMATED COMPLEX BASED ON A MINI-CHP WITH RECYCLING THE FLUE GAS TO METHANOL (p. 61–67)

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We developed a structure of the cogeneration plant (a four-generation plant), which, in addition to classic electrical and

thermal energy, produces methanol and oxygen. A distinctive feature of the plant is that methanol production is based on the recycling of flue gas from a mini-CHP as a result of the catalytic technological process. Production of oxygen is an additional product during production of hydrogen required for the synthesis of methanol. Production of hydrogen and oxygen is carried out by the electrolysis of water. Electrical energy required for the electrolysis is supplied by a mini-CHP. We designed computer automation for all plants of the system that enable implementation of practically autonomous, unmanned operation of the system.

Computer simulation of the system and study of the system's operation, executed in the environment of a universal software for technological modeling based on the physical and chemical balances, allowed us to calculate parameters of all product and energy flows, to confirm the feasibility of all employed chemical reactions and the alignment of the system's functioning as a whole with the expected results.

Keywords: co-generation, recycling of carbon dioxide, methanol production, oxygen production, electrical and thermal energy.

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