ABSTRACT AND REFERENCES

INFORMATION TECHNOLOGY. INDUSTRY CONTROL SYSTEMS

THE DEVELOPMENT OF MEANS OF DEFINITION OF THE OPTIMUM RATIO OF COMPUTATIONAL ALGORITHM AND THE RECONFIGURABLE STRUCTURE (p. 4-8)

Iryna Klymenko, Oleh Holovko, Maksym Hilliaka, Yaroslav Mytsio

Known tools for mapping tasks on a parallel computing structure, developed for fixed architectures or switched computing environment, are based on adaptation of a computing algorithm to caused computing structure and, thus cannot be effectively used to solve tasks of big and super big size in reconfigurable computing systems, which have certain software and hardware limitations. This describes the actuality and the value of the completed research.

We described and researched physical characteristic of the FPGA and defined main criteria that affect an efficiency of parallel computations based on the reconfigurable technology of the FPGA, particularly communication delays of the physical level of the FPGA chips. The new method to find an optimum ratio between a computing algorithm and a structure of the reconfigurable computing system of the FPGA is proposed. It allows to propose a new reconfiguration strategy, which differs from known by mutual adaptation of a computing algorithm and a computing environment.

We proposed and implemented a library of the functional core for the FPGA to solve tasks of linear algebra and matrix operations, which provides the set of functional blocks with optimum characteristics according to defined performance criteria of a reconfigurable computing space. The developed library allows to effectively vary the computation granularity in terms of reconfigurable computations.

The proposed tools and the results of the research allowed to increase the efficiency of the process of task mapping on the computing structure of dynamically reconfigurable computing systems, based on the FPGA to solve tasks of big and super big size with regular reconfigurable computing structures.

Keywords: reconfigured computations, computation granularity, field-programmable gate arrays, communication delays.

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DEVELOPING METHODOLOGY OF SELECTION OF MATERIALIZED VIEWS IN RELATIONAL DATABASES (p. 9-14)

Kateryna Novokhatskaya, Oleksii Kungurtsev

The paper explores a problem of MV selection in the technology of automatic MV creation. An algorithm of query grouping on the basis of comparison of abstract syntax trees was proposed, which makes it possible to reduce the number of created MVs and reduce the total amount of physical resources required for its servicing.

To solve the problem of MV selection out of the set of similar queries, a genetic algorithm was applied, which made it possible to distinguish the groups, for which a query execution efficiency increase by using MVs would be maximum while the maintenance cost would remain minimum.

The objective function was proposed, which takes into account the ratio of the query execution efficiency increase by using created MVs to their maintenance cost. It helps to define which groups require MV creation and which of them should be created as virtual, as well as helps to define the queries within one group, which will form the next central query, on the basis of which the final MV can be created.

Experimental data demonstrated that by using the proposed algorithm it is possible to obtain such a set of MVs, at which the maximum query execution efficiency at the lowest physical resources consumption for the servicing of these MVs is achieved.

Keywords: materialized view, a query evaluation, query grouping, central query, genetic algorithm.

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SYNTHESIS OF THE METHODS OF RESEARCH OF STABILITY OF THE ELECTRIC DRIVE "THYRISTOR VOLTAGE CONVERTER – INDUCTION MOTOR" (p. 15-25)

Andrew Boyko, Oleksandr Besarab, Vladimir Semeniuk, Elena Naydenko

In the open-loop systems of electric drive (ED) «Thyristor voltage converter – induction motor (TVC-IM) on the working section of mechanical characteristics, in some cases, the oscillations of the output values can be recorded. Such unstable modes are considered to be a negative phenomenon, which may limit the use of ED and is subject to detailed study.

The transfer function of electromagnetic part of an induction motor was determined, which characterizes the transient function of an electromagnetic torque. It is proved that for different motors the character of the changes in the torque varies, the necessity of selecting specific components of electromagnetic torque was substantiated. Based on the received transfer function, the synthesis of computational-analytical method of the study of the stability of the open-loop system of electric drive of TVC-IM was conducted. The analysis of stability was carried out with different induction motors of one series based on a simplified method by simulations and experiments. The assessment of the impact of different factors on the stability was made, namely: the IM parameters, load torques, the values of the angles of switching valves and initial electromagnetic conditions. It is shown that the study of the ratios of time constants of transient function of electromagnetic torque of IM and electromechanical time constants allows forecasting the possibility of the occurrence of oscillations. The analysis of influence of schematic configurations of pulse-phase systems of control of the TVC on the character of unstable modes was carried out. The results of this work make it possible to qualitatively and quantitatively characterize a mode of oscillations of TVC-IM, while also to determine the area of possible unstable performance, as well as to attempt to eliminate the preconditions to the occurrence of oscillability.

Keywords: induction motor, thyristor converter, open-loop system, stability, transfer function.

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CREATING AN AUTOMATIC CONTROL SYSTEM FOR INDUSTRIAL AIR CONDITIONERS (p. 26-31)

Oleksii Zhuchenko, Anton Korotynskyi, Vitalii Tsapar

The study suggests an automatic temperature control system for more than one industrial air conditioner since industrial equipment is much more complicated than household one and often requires working out individual projects.

The mathematical modelling of a water cooler of an industrial air conditioner is based on transfer functions that allow an accurate description of the object of control. This mathematical model reflects the real nature of changes in air parameters and can be used in the development of other temperature control devices.

The devised scheme simulates the behaviour of control systems for industrial air conditioners. The scheme of the control system is implemented in the Simulink package, MATLAB. It includes two air conditioners and operates in three modes that are determined by temperature ranges.

The research reveals the operational features of the automatic control system for two industrial air conditioners, reflecting the nature of changes in the air temperature and experimental values of the system operation time. The versatile nature of the new system distinguishes it among other automatic control systems and makes it valuable for further research in this area.

The possibility of adjustment to air conditioning peculiarities allows creating an improved control system that would resolve the problem and ensure an effective control of air conditioners. The research findings can be used in further individual projects of air conditioning of industrial buildings, which is likely to provide high-quality automatic air temperature control modes.

Keywords: industrial air conditioner, automatic control system, control scheme, temperature analyser.

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DEVELOPMENT OF A MODEL OF A DRIVER'S CHOICE OF SPEED CONSIDERING THE ROAD CONDITIONS (p. 32-38)

Nadezhda Kulbashnaya, Konstantin Soroka

The mathematical model of forming a driver's controlling actions as for the choice of a motion speed on the adjacent road sections was developed. For the development, the methods of the theory of automatic regulation with the application of the transmission functions of a driver and a motor vehicle were used. The model of driving a motor vehicle by the motion speed channel for the drivers with a low level of the motivational perception which was supplemented by another inertia link characterizing the reaction of a driver to the road situation was accepted as a basic one. The value of the maximum entropy of a driver's perception area was suggested as this characteristic. The periodic change of this parameter is considered on the sections with constant traffic conditions without any other traffic participants. This approach makes it possible to define how to arrange the road sections which follow one another to reduce to minimum the misalignance of a driver's information load on them.

The motion speed of a motor vehicle is obtained as the output value of the model. The margins of a change in the value of the maximum entropy and the limits of the value of speed corresponding to it were established. This makes it possible to simulate a driver's reaction to a change in the road situation.

With the help of the suggested model it is possible to assess the influence of the information content of the traffic environment on the results of a driver's activity, which finally, makes it possible to develop the measures for regulating the parameters of a road situation and to influence a driver's working conditions.

Keywords: behavior of driver, perception of information, entropy of environment, motion speed, transmission function.

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DEVELOPMENT OF SYSTEM OPERATIONS MODELS HIERARCHY ON THE AGGREGATING SIGN OF SYSTEM MECHANISMS (p. 39-46)

Igor Lutsenko, Elena Fomovskaya, Elena Vihrova, Olga Serdiuk

Now there is a terminological uncertainty concerning such basic cybernetic categories as a mechanism, a product, an operation. Such uncertainty, on the one hand, is caused by the fact that these categories, essentially, are interconnected. On the other hand, the object of research has to be defined by the class of solvable task.

As the concept "operation" is an abstraction of the highest level, it is necessary to establish compliance between the area of research and the type of operation. That is, there is a need for the decrease of the degree of abstraction, however, the power of the set connected with the concept "operation" has to be reasonable.

In the work, compliance between a hierarchical representation of the system mechanism structure which degree of hierarchy is expressed as the aggregating sign, and the power of the registration model of the system operation is established.

Identification of operations on the aggregating sign of system mechanisms allows to expand the conceptual cybernetic framework and to systematize problems which are solved in the course of operations research.

It is found that the cybernetic operation is the result of the interaction of system products and system mechanisms directed to transformation of input products of the operation to output products of the operation.

Definition of the cybernetic operation model as forms of data presentation displaying results of procedural interaction of system products and system mechanisms is given.

It is noted that a distinctive feature of the cybernetic operation is a limitation of its duration in time.

Definition of the operation and the operation model allows determining the area of developments connected with the statement and the solution of problems in operations research.

It is found that the registration model of any sets operation can be presented in the form of two functions comparable to each other: input and output functions.

Definition of input and output functions is a necessary and sufficient condition for unambiguous identification of the studied operation concerning its efficiency.

Keywords: classification of mechanisms, classification of products, operation, operation model, efficiency of use of resources.

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DESIGNING AN APPROACH TO BUILDING THE TEAMS OF HIGH TECHNOLOGICAL PROJECTS PERFORMERS AT VIRTUAL INSTRUMENT-MAKING ENTERPRISES (p. 47-54)

Andrii Sobchak, Elena Shostak, Tamara Tseplyaeva, Olga Popova, Anna Firsova

The approach to building the teams of the performers of high technological project is described, directed toward a decrease of uncertainty in the process of realization of a future project, connected with the establishment of compliance among the tasks of the project, which have innovation nature, and by the level of competence of potential performers. The key stages of the approach are: forming the base of contenders for participation in the project; assessment of competence of contenders; forming alternatives of the composition of a project's team; analysis of alternatives with the aid of the scripted methods of collective expert evaluation; selection of a rational variant of the team of the performers of a project. The relevance of the conducted research is determined by the world-wide trend of development of post-industrial society in the direction of the virtualization of production. In the course of the performed study we proved the expediency of development and application, in the process of personnel management at a virtual instrument-making enterprise, of special methods of selection the contenders for the composition of the teams of high technological projects planned for implementation. Based on them, it is possible to design tools of decision making support to both top manager and HR-manager of VIE. The described approach, unlike the known ones, makes it possible to decrease the level of uncertainty (NO-factors) in the aspects of incompleteness, carelessness, inaccuracy. The applied significance of the results of the study can be quantitatively evaluated on the basis of a special method, designed in the course of the study. This method is directed toward the assessment of economic efficiency of the application of this approach to the process of designing high technological projects, which will make it possible to decrease overhead expenses at planning the strategy of VIE.

Keywords: high technological project, virtual instrument-making enterprise, team of performers of a project, expert evaluation of scenarios.

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