THE METHOD OF SOCIO-TECHNICAL SYSTEMS INFORMATIONAL STABILITY EVALUATION AT THE INFORMATIONAL WAR CONDITIONS (p. 4-11)

Andrey Dudatyev, Vladimir Luzhetsky, Dmitriy Korotaev

The method of evaluation of the informational stability of socio-technical systems, which are influenced by specific informational and psychological operations in the information war is presented. The method uses a logical-probabilistic model and a probabilistic measure for evaluating the informational stability of the system. The proposed informational stability measure is based on the concept of minimum unit of information, designed to change human consciousness – a meme and uses probabilistic estimates of occurrence of so-called destructive and compensatory memes, i.e. the meme, used for the informational and psychological operation (reprogramming of the consciousness of the social part of the SLS) and the compensating meme, the use of which minimizes the consequences of the destructive meme. For decision-making with regard to the stability of the social part of the SLS, a flexible scale that can be adapted to any object of research is proposed.

An approach to the construction of the so-called vector of stability of the social part of the SLS, which provides a visualization of the derived probabilistic estimates of a violation of confidentiality, integrity and availability, is proposed.

The method is of practical interest since it allows considering an actually weakly formalized class of threats – informational and psychological operations, the aim of which is a destructive impact on the social part of the SLS. The proposed method is useful for the decision-making on the management of complex informational security at the “enterprise-region-state” level.

Keywords: information war, informational stability, informational and psychological operation, probabilistic stability measure, information meme.

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ANALYSIS OF APPLYING METHODS OF DATA COMMUNICATION BETWEEN PROGRAMMATIC UNITS IN ENGINEERING CALCULATIONS (p. 11-18)

Dmytro Sidorov, Irina Kazak

The study considers methods of data communication between programming units for performing engineering calculations of technological equipment through Fortran 90 and more advanced examples of software that are used in mechanical engineering and related industries. Modern Fortran was applied to analyzing methods of data communication between programming units (through lists of parameters, common blocks, modules, and a file interface) that are involved in engineering calculations for technological equipment to expand professional usability of such methods for engineers.

The analysis has revealed a possible loss of data calculation accuracy in case of using a file interface to transfer data between programming units. Other data communication methods guarantee obtaining results within the accuracy of the bit grid for particular data types. Numerous results of testing these programs and the examples in this study show that the calculated data coincide completely in any transfer from one of these methods to another as well as in combining the methods. Among all the considered methods, we have determined that the use of modular...
design of the interface between programming units seems to be quite an optimal compromise between convenience of programming and efficiency of operating a particular program. In the field of chemical engineering, professional modern Fortran-based engineering calculations of technological equipment can be more efficient if they are made by using different methods of data communication between programming units.

**Keywords:** loss of accuracy, programmatic unit, communication of data, Fortran, mechanical engineer, engineering calculations.

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**INTEGRATION OF ASPECT-ORIENTED APPROACH MEANS IN OBJECT-ORIENTED PROGRAMMING LANGUAGE (p. 19-28)**

Valentina Medvedeva, Bohdan Hukivskyi

The problem of complexity of developing and supporting the software cross-cutting concern and its solution using the aspect-oriented approach is examined. The complexity of aspect-oriented programming application in object-oriented programming languages is described. The problem of dependency of the declaration syntax of aspects and the method of their integration is investigated. The architecture that will provide the independence of the syntax of declaration and introduction of aspects in object-oriented programs is proposed. For separation, an urban design pattern that unites declaration of the aspect and its integration method is used. The system displays the classical entities of AOP in the object structure, which facilitates syntax mastering. Three methods for declaring aspects are developed, namely declaration using inheritance from a base class, template class generalization and flexible aspect creation at run time. For integration at compile time, a special integration module and the Roslyn compiler modification, which ensures implementation of the aspect configuration system and introduces advice invocation points in a code are developed. For integration at run time without using the dependency injection container, helper methods for creating proxy classes are designed. Also, modules for popular dependency injection containers, which allow integration by means of these containers are developed. Testing of the developed system, which showed a significant reduction in the size of a source code is carried out. The most pronounced reduction was in large enterprise-level systems. When using introduction at compile time, performance drop of programs is not observed. When using integration at run time, performance losses do not exceed those when using a similar proxy class.

**Keywords:** aspect-oriented programming, AOP, aspect integration, cross-cutting concern, software architecture, aspect, advice, join point, pointcut.

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It is shown that a high percentage of defective rubber-metal articles at the manufacturing process output is caused by neglecting the subsystem parameters connectivity at the design stage separately within the design and technology, as well as between these subsystems.

The research is aimed at increasing the rubber-metal articles production stability and improving the rubber products quality through the development and introduction of a new integrated approach to the design and technology parameters optimization.

In the general system of the integrated design of rubber-metal shock-absorbers, the subsystems of designs and manufacturing technologies are singled out, and the correlations between the parameters within these subsystems and the parameters of different subsystems are identified.

Optimization problems have different objective functions, in which arguments often coincide fully or within certain boundaries. This significantly complicates calculations since the optimization problem in this case is often multiojective and multietremal. To solve this problem, the method that involves complex evolutionary optimization by means of a genetic algorithm is applied.

For this, new attributes of the genetic algorithm are created. In particular, new star-shaped character models (chromosomes), with internal links between individual parents and flexible constraints on the variation of the later during optimization are developed. The result is a paradoxical conclusion: there is an additional possibility to perform multi-criteria optimization of the design and manufacturing technology of rubber-metal articles deeper than with Pareto optimization because Pareto optimization involves a single value for all iterations of search of objective functions in the evolutionary optimization, and the arguments on each iteration may differ on some, connection depth-dependant value when using the proposed method.

Keywords: rubber-metal articles, parameters connectivity, genetic algorithms, complex character models.

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The study suggests a method of improving operational control at an agricultural enterprise in terms of informational support. The method involves dynamic and interactive information analysis panels (dashboards) as an instrument of information analysis support in choosing an optimal real-time solution by the work performer. The suggested approach was developed into a definite improvement of its implementation by an agricultural enterprise at the management of agricultural production indicate an expediency of the introduction of modern information technologies; today it can be already implemented at existing farms. The study provides dashboards for selecting a machine-tractor unit by performance indicators and for building a flowchart for performing a technological operation,” both implemented in the medium of a Microsoft Excel spreadsheet.

The suggested interactive dynamic dashboards in the operational management of agricultural production facilitate rapid re-planning of technological operations by the work performer in real time, significantly reducing the time spent on the necessary calculations and improving their quality. It furthermore produces beneficial effects on the efficiency of production process control at enterprises. The results of evaluating the economic benefits of using the suggested dashboard technology in the operational management of agricultural production indicate an expediency of its implementation by an agricultural enterprise at the operational control level.

**Keywords:** operational control, information technology, dashboard, Microsoft Excel, plant growing, selection of a machine-tractor unit, flowchart, economic benefit.

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**AUTOMATION OF CONTROL PROCESSES OF TECHNOCAL EQUIPMENT WITH ROTARY HYDRAULIC DRIVE (p. 44-50)**

**Volodymyr Sokolov, Yuliya Rasskazova**

The problems of automation of control processes of technological equipment with the rotary hydraulic drive are considered. The purpose of the paper is synthesis and study of the ACS for equipment that allows for the stochastic disturbance and observation noise.

The mathematical model of technological equipment with the rotary hydraulic drive as an object of automated control is developed. The mathematical description is a set of linear dynamic links with characteristic parameters, namely the time constant of the pump displacement control process; the time constant of the drive power section; transmission coefficient for the tilt angle of the washer (cylinder block) by the control voltage; transmission coefficient of the drive power section; transmission coefficient for the angular velocity by the loading point.

The ACS of equipment that allows for the observation noise and stochastic disturbance of the control object is synthesized. The solution of the problem of the stochastic optimum linear system with incomplete information about the state according to the method of distribution is divided into two: the problem of synthesis of the optimum supervisor and the deterministic problem of synthesis of the optimum system. To develop the optimum linear controller, the dynamic programming method is used.

The study of dynamic characteristics of the ACS is carried out. It is shown that in the range of possible disturbance...
options, the Kalman-Bucy supervisor performs the function of optimum filtering, reduces the transient duration and provides necessary equipment control quality. The calculations of transients for angular displacement and angular velocity at different values of the transmission coefficient of the pump displacement control unit and the transmission coefficient of the controller are made. Recommendations for selecting the optimum values of transmission coefficients allowing for the features of the technological purpose of equipment are given.

The research results can be used to improve the technological equipment, particularly to expand functionality and enhance dynamic characteristics.

**Keywords:** technological equipment, hydraulic drive, transfer function, stochastic disturbance, automated control system.

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