CONTENTS & ABSTRACTS

Veresnikov G.S., Egorov N.A., Kulida E.L., Lebedev V.G.

It is noted that the aircraft landing problem is one of the main tasks in the planning and regulation of air traffic flows, which requires the use of a sufficiently serious mathematical apparatus. A brief overview of the main approaches to the formulation and solution of this problem is presented.

Keywords: air traffic, objective functions, the aircraft landing problem, linear programming, branch and bound method.

Galyaev A.A., Lysenko P.V.

Two minimum-time control problems are considered for the mechanical system consisting of material point and obstacle surface which interact with each other by the means of the elastic or visco-elastic spring. Interaction time interval is determined by physical conditions of contact. The dependences are studied of full interaction time and restitution coefficient on visco-elastic spring properties. The Python program is developed and the «material point — obstacle surface» system behavior modelling is conducted.

Keywords: mechanical system with impacts, Kelvin-Voigt media, minimum time control.

Tsirlin A.M., Hovsepyan V.S.

The problem is considered of robust stability and choice of typical regulators parameters of single-loop linear systems with feedback for technological objects with delay. The set of possible parameters values of object transfer function is assumed to be closed and bounded, while the magnitude and the phase of amplitude-phase characteristic of an open system decrease monotonically with a frequency.

Keywords: systems with delay, robust stability, technological objects, robust tuning.

Rusev V.N., Skorikov A.V.

The approximation of the renewal function is considered for recurrent flows. The failure-free operation time is assumed to be described by the two parametrical Weibull-Gnedenko distribution. Analytical and numerical approaches (based on discretization methods) are proposed for the solution of Volterra integral equation. The relationships and algorithms obtained were verified by control cases using the Wolfram Mathematica mathematical software package. The results presented are applied to the «block replacement policy» to provide the reliable and effective functioning of technological objects.

Keywords: renewal function, the Weibull-Gnedenko distribution, the Volterra integral equation, moments generating function, discretization techniques of integral equations, reliability monitoring, block replacement policy, computer modelling in Wolfram Mathematica.

Belov M.V., Novikov D.A.

The foundations of the complex activity theory are described, extending the methodology to the case of any complex (having a non-trivial multi-level internal structure) human activity. The structural elements of complex activity are considered, its logical, causal and process structures are constructively described. It is shown that the system of co-ordinated formal models ensures the practical application of the results both for practitioners and for scientists engaged in research of general principles of organization of activity (practical, scientific, etc.) and of management of organizational and technical systems. It is for the first time that the description formalism of the complex activity is proposed together with the subject — the organizational and technical system.

Keywords: complex activity, uncertainty, organization, control, management.

Somov S.K.

It is noted, that information-technological backup is a new type of information redundancy, the use of which in distributed automated informational control systems allows to increase the efficiency of their performance while processing the typical user requests. The task of optimal allocation of identical copies of information-technological backup throughout the nodes of the distributed system is formulated in the form of a minisum problem of finding the p-median of a graph. The algorithm is proposed for solving this problem and the example of the solution is given. The brief analysis of the solution algorithm results is performed.

Keywords: distributed data processing system, computer network, information-technological backup.

Podlazov V.S.

The system-area network is proposed in the form of a non-blocking three-dimensional complete multiring. The structure of a multiring is developed and the algorithm is suggested of a conflict-free laying out direct paths between its nodes by means of dynamic local self-routing in them.

Keywords: system-area network, generalized hypercube, complete multiring, switching properties, non-blocking network, direct channels, conflict-free self-routing, local dynamic self-routing.

Babushkina N.A., Kuzina E.A., Loos A.A., Belyaeva E.V.

The mathematical description is presented of the two stages of tumor cells' death as a result of the body's immune response after antitumor viral vaccine introduction. The mathematical description in the form of a system of nonlinear differential equations is realized as a software set by means of the MatLab-Simulink system. As a result of the computing experiment, the two strategies of the effective application of the antitumor viral vaccine were determined. The first strategy leads to complete elimination of the tumor cells after a single-shot administration of the vaccine. The second strategy allows stabilizing tumor size through the recurrent introduction of the vaccine. The approach proposed to explore the effectiveness of vaccine therapy can be applied to different types of experimental tumors and antitumor vaccines.

Keywords: mathematical model, tumor cells, antibodies, moment of vaccine administration, vaccine effectiveness, immune response, virus, vaccine therapy.

Zavadsky V.K., Ivanov V.P., Kablova E.B., Klenovaya L.G.

The method of integration the flow and level measurement information and new control algorithms allowing to increase the propellant consumption control system work accuracy in normal operating mode and in case of onboard equipment failure.

Keywords: the measuring information integration, filtration, control accuracy, the emergency situation.