



CONTENTS & ABSTRACTS

METHODS FOR SOLVING OF THE AIRCRAFT LANDING PROBLEM. PART 2. APPROXIMATE SOLUTION METHODS. 2

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

Methods are considered of an approximate solution of the static problem of forming the optimal aircraft queue for landing, which do not guarantee an accurate solution but provide an opportunity to obtain an acceptable solution that meets the requirements. It is noted that typically they are a synthesis of a meta-heuristic method of global optimization to obtain the landing sequence of aircraft and a local exact method to find the optimal solution for the sequences obtained. The brief overview of some of them is presented.

Keywords: optimal queue for landing, objective function, genetic algorithms, global and local optimization, memetic algorithms.

OPTIMAL CONTROL PROBLEMS FOR CERTAIN LINEAR FRACTIONAL-ORDER SYSTEMS GIVEN BY EQUATIONS WITH HILFER DERIVATIVE. 14

Postnov S.S.

Two optimal control problems are investigated for linear time-invariant systems of fractional order with lumped parameters, which dynamics is described by equations with Hilfer derivative: control problem with minimal norm and time-optimal control problem with control norm constraint. Controls are considered that are the p -integrable or essentially bounded functions. Investigation is conducted by the method of moments. Correctness and solvability conditions of the problem of moments are obtained for the problem statement considered. The optimal control problems stated are solved analytically for several particular cases and the properties of the solutions are investigated depending on fractional differentiation indices and Hilfer fractional differential operator parameters. The comparison is conducted of the results obtained with the known results for integer-order systems and fractional-order systems described by equations with Riemann-Liouville or Caputo derivative.

Keywords: optimal control, problem of moments, fractional-order system, Hilfer fractional derivative.

GENERALIZED STOCHASTIC NETWORKS WITH NON-STANDARD EVENTS EXECUTION DISCIPLINES. 26

Ivanov N.N.

The notion of a generalized network is extended by including the vertices into these networks with non-standard events execution disciplines in order to provide these vertices with possibility to manage dynamic processes of different kind, occurring in the networks. General principles are considered of the constructive describing the design of networks with such vertices, that can be the basis of their statistical analysis.

Keywords: generalized stochastic networks, critical path, event execution discipline, time of network execution.

DISRUPTIVE SITUATIONAL CONTROL. 31

Bauer V.P., Zatsarinny A.A., Ilyin N.I., et al.

It is noted that the classical approach to situational control is based on the possibilities of logical-linguistic models, artificial intelligence, deductive and inductive inference, neural and expert systems. It is shown that the issues of social, humanitarian and cognitive nature, fast coordination of collective decisions in a self-organizing environment, civil and expert participation take on particular relevance now. The increase in the complexity of models' semantics is substantiated: it is not in several times, but in several orders of magnitude higher. A new — disruptive — paradigm of situational control is proposed, in which the system of distributed situational development centers becomes the main institutional and digital platform for support of the collective processes of participants consolidation at all levels of government.

Keywords: cognitive semantics, self-organization, situational control, strategic planning, situational development centers, decision support systems.

FOUNDATIONS OF THE COMPLEX ACTIVITY THEORY. PART 2. LIFE CYCLES OF COMPLEX ACTIVITY. ORGANIZATION AND MANAGEMENT AS A COMPLEX ACTIVITY. 39

Belov M.V., Novikov D.A.

In the second part of the article the foundations of the complex activity are described. The life cycles of complex activity are considered. Categories of organization and management are analyzed and summarized, formal models of organization and management are developed.

Keywords: complex activity, life cycle, organization, control, management.

GAME-THEORETICAL MODELING OF CONFRONTATION BETWEEN THE PARTIES BASED ON THE REFLEXIVE CONTROL. 49

Vasiliev G.A., Kazakov V.G., Tarakanov A.F.

The mathematical model of the reflexive control is constructed. The processes of strategies choice are described, and the situation of the reflexive control initiation is determined. Based on this situation, the optimal strategy for control body is determined and an algorithm for its finding is proposed. As an application of the model, the distribution of weapon systems by targets is described, the criterion for evaluating reflexive control has been constructed and numerically tested.

Keywords: reflexive control, evaluation criterion of control.

NETWORK INFORMATION-COMPUTING SUPPORT OF AUTOMATIC MOBILE OBJECTS INTERACTION. 56

Stetsyura G.G.

The ways and the means are suggested of performing synchronized distributed computing for quick interaction support in a group of automatic mobile objects. The computations are controlled decentrally and are performed on the transmitted messages content during the transmission process without delay for performing the computation. The transmitters synchronize the messages transmission so that the same bit positions of messages group are processed simultaneously. It is shown that the solutions suggested accelerate the reaction of a system operating in a hard real-time conditions on changes in the system state and in the external environment.

Keywords: local computer network, quick synchronization, distributed computing, mobile multi-robot systems, analog-to-digital computing.

INFORMATION-CYBERNETIC APPROACH TO THE STUDY OF DIDACTIC SYSTEMS. 66

Mayer R.V.

System, synergetic and information-cybernetic approaches to the analysis of the teaching process are discussed. The functioning of the didactic system from the viewpoint of control theory is considered, the influence of direct and inverse connections at various stages of its functioning is analyzed. The computer model of the «teacher — learner» system is proposed, based on regularities of learning and forgetting. The system is shown to be self-adapting and capable of successfully functioning at different parameters of the learner and the learning process.

Keywords: didactics, cybernetic approach, computer modeling, training, control theory, learner, teacher.

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Muranov A.A.

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Keywords: launch vehicle, fuel expenditure control system, abnormal situation.

APPLICATION OF THE SEMI-DEFINITE RELAXATION METHOD TO THE ATTITUDE DETERMINATION OF THE RIGID BODY. 79

Rapoport L.B.

The method of semi-definite relaxation is applied to the problem of attitude determination of the rigid body with respect to the local horizon using satellite navigation. It is shown how the original nonconvex quadratic programming problem can be merged in a wider class of convex optimization problems that admit an efficient solution. Instead of the original computationally complex problem, a convex problem is solved that gives an approximate solution of the original problem. The proposed approach is applied to the processing of experimental data.

Keywords: satellite navigation, semi-defined relaxation, Wahba problem.