CONTENTS & ABSTRACTS

The algorithms of output controllers design are proposed for linear scalar plants, that ensure the desired or attainable values of oscillation index and of degree of stability, determining the settling time. Both modal control and H_∞-approach are used in the design procedures. Examples are constructed, demonstrating that striving to provide the degree of stability that is much greater than the distance from the nearest left zero of the plant transfer function to the imaginary axis (even for the minimum phase plants) leads to the quite small gain and phase stability margins, that is unacceptable in practice.

Keywords: linear systems, controllers design, oscillation index, degree of stability, settling time.

The problems of the project management are considered within the framework of the strategy of transferring Russian Federation State Programmes to project principles, the advanced methods of solving these problems are proposed. The algorithm is developed of forming the system of projects realization contensive control. The possibility of forming the system of preliminary control is shown, allowing to determine the projects priority, the amount of necessary for their implementation resources, and the actual estimates of their execution time. The formation of the system to supervise the preparations for the project implementation is substantiated, allowing to discard the unconscientious contractors and select the effective project executors. The algorithms of monitoring the indicators of the project implementation are constructed as well as of the project developers' performance parameters control.

Keywords: project management, planning, national project, public administration, efficiency.

A concept of the sustainable management in arbitrary complex dynamical systems with human participation (active systems) is presented. It is noted that the sustainable development means satisfying the requirements of homeostasis and system consistency. The mathematical formalization of the problems of the sustainable management in active systems is based on the technique of differential games in a normal form, in a form of characteristic functions, and with hierarchical structure. The formulations of the sustainable management in active systems with independent agents, cooperative agents, and hierarchical control are given. The particular classes of incentive models and models of coordination of the social and private interests are considered. The review of several other applied problems solved in the frame of the proposed concept is given. An illustrative example is provided. The emphasis is placed on the methodical aspects of the developed concept.

Keywords: active systems, cooperation, differential games, hierarchical control, sustainable development.

The study presents the analysis of the effect of technological shocks on the economic system within the framework of previously described dynamic multi-sector model of imperfect competition. It is shown that the distinguishing feature of the model is in asymmetry of the response to negative and positive shocks. Namely, economic recession following negative shock is greater in absolute terms than growth appearing after positive shock of the same amplitude. It is shown that this kind of shocks leads to changes in the structure of the input-output network.

Keywords: shock, input-output network, agent-based model, computer simulation.

The system of automatic text processing is developed that determines the text subject based on the terminology used, according to the dictionary of terms. The application of regular expressions is proposed and justified in domain-specific dictionaries used in the programs of text analysis in natural languages. The interrelation of regular expressions and finite automata through regular sets is noted and described. A quantitative assessment is suggested of the thematic focus of the text investigated — the document profile, calculated by the terms search results. The system is implemented in practice in the form of a software package with a dictionary version for the selected subject area — control theory and its applications. The system was tested on the archive of the journal «Automation and Remote Control». The profiles of the thematic focus of the articles taken from various sections of the journal were obtained. The opportunities of the system development are indicated.

Keywords: term, domain dictionary, regular expression, finite state machine, document profile, software package.

The approaches are considered to the construction of a graph operating model of management of the production complex. The graph model is proposed, consisting of several clusters, in particular, a resource cluster, a cluster of materials, and a cluster of a production calendar. It is shown that the model proposed can be used to solve such planning tasks as the construction of the master schedule for material requirements and capacity planning. It is noted that main advantages of the new model are openness for further changes, the possibility of applying graph algorithms to solve optimization problems, the compatibility with modern graph databases, the possibility for business optimization specialists to work directly with model.

Keywords: production planning, material requirements and capacity planning, integrated planning, graph operating model.

Algorithms are given for solving the actual for small- and medium-scale production problem of building the timetables of assembly works execution for some set of products, differing by production technologies. The optimality criterion of the task formulated is the fulfillment of the whole complex of works as quickly as possible. The sequence that is the most effective for practical implementation and close to the lower estimated bound on the optimal solution is determined, as well as the assembly operations start and end times for all products at each of the assembly stations, and the completion time of the production plan fulfillment. The algorithms developed are illustrated with numerical examples.

Keywords: assembly line, optimal sequence, assembly work, scheduling algorithms.

The existing neural network tuner of PI-controller is improved in such a way that to be able to adjust parameters of a PID-controller. The new structure of a neural network for the tuner is defined for this purpose, its rule base is updated, and the stability criterion is proposed for the system with the tuner and the PID-controller. The new version of the tuner is applied to control a typical heating furnace during numerical and full-scale experiments in order to maintain the required quality of transients under the condition of the furnace parameters non-stationarity. It made it possible to reduce the furnace power consumption by 8,4 % through the full-scale experiments in comparison to common PID-controller.

Keywords: non-stationary heating furnaces, neural network tuner, PID-controller, sustainability, rule base.

The problem is considered of choosing the sample of the autonomous underwater vehicle (AUV) among the variety of types of existing underwater vehicles for use in groups. In contrast to the particular vehicle sample choice upon its contribution to the group functioning efficiency, the approach is suggested that takes into account the way the AUVs are organized within the group. The mathematical model is developed of the functioning of the group; the fuzzy logic is applied to form the efficiency parameter. Different variants of group organization (rank, swarm, flock, multi-agent system) are considered on the example of task solution of water basin survey. The advisability is shown on the results of the numerical experiment of taking into account not only the individual contribution of each vehicle to the group efficiency, but the way they are organized within the group as well.

Keywords: autonomous underwater vehicle, reliability, efficiency, decision making, fuzzy logic.