

# CONTENTS & ABSTRACTS

## CONFORMAL BEHAVIOR MODELS.

### PART 1. FROM PHILOSOPHY TO MATH MODELS. . . . . 2

**Breer V.V.**

The first part gives the review of conformal behavior studies by various sciences — philosophy, culturology, theoretical, practical, and social psychology. Attempt of classification of mathematical models of conformal behavior as a special case of social interactions models is carried out. Schelling and Granovetter models which gave rise to other mathematical models are considered in details.

**Keywords:** conformal behavior, social interaction, model of critical mass, threshold model of social interaction, social-physics model, crowd control.

## GUARANTEED RISKS AND OUTCOMES

### IN «GAME AGAINST NATURE» . . . . . 14

**Zhukovskiy V.I., Soldatova N.G.**

One-criteria problem under uncertainty is considered. There are only the limits of change that are known about uncertainty. The two concepts of formalization of guaranteed (for outcomes and risks simultaneously) solution are offered. The first concept is based on the method of decision-making in two-level hierarchical game. The second concept is based on the vector-maximin definition. The explicit form of solution under linear-quadratic criterion is found.

**Keywords:** strategy, uncertainty, criterion, minimax regret and maximin, vector-optimum.

## THE INTELLIGENT MANAGEMENT SYSTEM OF DEVELOPMENT OF REGIONAL

### TRANSPORT-LOGISTIC INFRASTRUCTURE . . . . . 27

**Bychkov I.V., Kazakov A.L., Lempert A.A., Bukharov D.S., Stolbov A.B.**

The paper considers the intelligent system based on ontology, formalized expert knowledge, mathematical models, and numerical methods. The system focuses on decision support for development of regional transport-logistic infrastructure. Particularly, for examination of transport-logistic systems the developed complex approach is used with the author's conception of multilevel modeling. Some short descriptions of formalized mathematical models and integrated program units are presented. Modern intellectualization tools are used for the program units communication and processing of statistical data. Several model tasks and applied problems are solved with use of the intelligent system, and results of tasks solution are given.

**Keywords:** intelligent system, production rules, knowledge bases, ontology, integration, multilevel modeling, transport logistics.

## FOUR-STAGE BRAINSTORM . . . . . 36

**Sidelnikov Yu.V.**

The paper proposes the four-stage brainstorm, which removes the number of deficiencies of many other brainstorm modifications. The proposed modification allows to increase the brainstorm effectiveness by increasing the contribution of preparatory stage and adding the fourth stage, in which the possibility of problem definition reformulation, on the basis of information obtained at the previous stages, is provided. Furthermore, the responsibilities of leaders of the second and third stages are extended and thoroughly prescribed.

**Keywords:** expert estimations, brainstorm modification.

## REAL ESTATE MASS APPRAISAL MODELS DESIGN

### WITH THE SPATIAL DEPENDENCE. . . . . 45

**Belyaeva A.V., Grebenuk E.A.**

The paper proposes the new approach for real estate mass appraisal models design with location effect factors influencing the price: the distance to influence centers and the real estate listing neighborhood. The models are designed to implement the approach. The results showed that the joint consideration of both factors significantly improves the quality of the model.

**Keywords:** spatial correlation, Moran test, Lagrange multiplier tests, spatial autoregressive model, influence centers.

## MODELING OF CORRUPTION IN THREE-LEVEL

### CONTROL SYSTEMS . . . . . 53

**Ougolnitsky G.A., Usov A.B.**

The dynamic models of corruption in three-level control systems of the consequent structure are considered. The definitions of equilibria in three-person dynamic games with respect to sustainable development requirements with corruption are given, algorithms of their construction are proposed. The models of economic corruption in the systems of surface water quality control based on corresponding informational patterns are considered, the examples of numerical calculations are given.

**Keywords:** corruption, dynamic games, hierarchical control system, compulsion, impulsion, conditions of sustainable development.

## EXASCALE SUPERCOMPUTERS. ARCHITECTURAL

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**Stepanenko S.A., Yuzhakov V.V.**

Architectural aspects of exascale computing systems are explored. Assessments of performance of computing systems and communication environment are made. Necessity and potential of architectural efficiency scaling solutions are demonstrated.

**Keywords:** hybrid architectures, architectural efficiency scaling solutions, hybrid reconfigurable structures, minimization of communication time, topological redundancy.

## RAILWAY NETWORK DISCRETE-EVENT MODELS . . . . . 73

**Potekhin A.I., Branishtov S.A., Kuznetsov S.K.**

The paper develops discrete-event models of railway network basic elements: track region with track for passing, track, track segment, track-section, turnout (router) and models of train movements. The elements models are presented as Petri Nets with inhibitor and enabling arcs. Group control for these models is implemented by special developed control components (supervisors) that meet traffic safety requirements.

**Keywords:** discrete event models, Petri nets, supervisor, railway net, railway region, station-to-station block, railway track.

## APPLICATION OF LAGRANGE MEAN VALUE THEOREM

### TO CONTROL OF TRANSPORT SYSTEMS . . . . . 82

**Blyumin S.L., Sysoev A.S.**

The paper considers the definition of optimal functioning problem for a regulated city intersection as well as the applicability of Lagrange mean value theorem to elaboration of control decisions for this kind of intersection based on the factor analysis of transport delay. The numerical example is given.

**Keywords:** Lagrange mean value theorem, control of transport systems, transport delay.