MODELING AND CONTROL

K.S. Yakovlev, D.A. Makarov, E.S. Baskin. UAV path planning technique under flight dynamics constraints

In the article we solve path planning task for an agent being multirotor unmanned aerial vehicle (multicopter). We propose an approach of estimating path geometry constraints based on UAV flight dynamics model and control constraints. Than we introduce a new path finding method which takes into consideration those geometry constraints and study this method both theoretically and empirically.
Keywords: unmanned vehicle, unmanned aerial vehicle, intelligent control system, planning, angle-constrained path planning, heuristic search.

G.S. Veresnikov, L.A. Pankova, V.A. Pronina. Uncertain multiobjective programming in the design of aircraft

The article considers the problem of preliminary aerodynamic design of aircraft weight summary. The design process is characterized by the inevitable noise and uncertainty. For modeling uncertainty a number of theories was offered. The most popular is the theory of fuzzy sets by Zadeh. The latest development is the theory uncertainty of chinese mathematician Baoding Liu. Now the theory of uncertainty is a branch of axiomatic mathematics for uncertainty modeling. The theory of uncertainty has been widely used in practice in optimal control problems. The article outlines the basic tenets of the theory of uncertainty and describes models of uncertain programming. Formulation of the problem of preliminary aerodynamic design of aircraft weight summary is proposed as the problem of uncertain multiobjective programming. To solve this problem the multiobjective genetic algorithm is applied.
Keywords: uncertain variable, uncertain programming, design, multiobjective genetic algorithm

KNOWLEDGE ENGINEERNG

A.V. Zhozhikashvili. Agreement and difference method by J.S. Mill in category theory language

The paper describes usage of the category theory pattern matching language for formalization of the method of agreement and the method of difference underlying for automatic hypothesis generation.
Keywords: intelligent knowledge-based systems, category theory, JSM-method.

A.A. Kulinich. Conceptual templates of ontology in the ill-structured subject domains
Models of knowledge representation of ill-structured subject domains in the form of the conceptual templates constructed on the basis of knowledge about one object of this subject domain are investigated. Questions of expert ontology construction on the basis of its conceptual template for cases when values of object signs accept binary values and values from the ordered set of possible values are considered.
Keywords: ontology, the conceptual template, ill-structured subject domain, semantic space, structuring of semantic space.

INTELLIGENT SYSTEMS AND TECHNOLOGY

A.V. Smirnov, A.M. Kashevnik, A.V. Ponomarev, S.V. Savosin. Organization of Smart Space Services Interaction for Hybrid Systems Control

The paper presents an approach for organization of smart space services interaction for hybrid systems control. The case study of room cleaning in smart home is considered. The smart space technology is used system processes interaction support. For the interoperability of the processes interaction, ontological approach is used. Hybrid automata is used for the behavior description of every system process that allows automation of program code generation and implement system processes verification.
Keywords: hybrid systems, hybrid automata, smart spaces, ontologies

A.I. Molodchenkov. Analysis of results of the algorithm for automatic identification of patients individual characteristics that affect the choice of treatment

The paper presents an estimation of AQ-algorithm results for solving the classification problem on the three examples in the field of medicine. The results of the algorithm were compared with the results of classification algorithms BayesNet, J48graft and JRip. For the experiments, the tools AQ21 and Weka were used.

Keywords: artificial intelligence, machine learning, AQ-algorithm, WEKA, BayesNet, J48graft, JRip, assessment criterion, recall, accuracy.

V.F. Zadneprovskiy, V.P. Fralenko, M.V. Khachumov. Intelligent technologies in the oilfield management

The subject matter of this research work is the development of new approaches to improve management of oil wells and field in general by artificial intelligence methods. Proposed a three level intellectual field management system that providing an overall optimization of oilfield production and equipment operations; reveals necessary for all levels implementation applied artificial intelligence tools features. Concept and proposals may offer a starting point for future researches and building a real "smart wells" and "smart fields".

Keywords: intelligent field, oil, mining, artificial intelligence.

DATA ANALYSIS

E.D. Kornilina, A.P. Mikhailov, A.P. Petrov. On application of data mining techniques to research of manifestos of political parties

The paper presents a new method for determining the proximity of political positions contained in manifestos, i.e. the election programs of political parties, as well as other documents published by the parties to attract voters, which is based on latent semantic analysis. The approach is based on the conjecture that the proximity of political positions reveals itself as syntagmatic proximity of texts of the manifestos. A detailed description of the algorithm is presented, which includes the preprocessing of text, breaking it into fragments, "fragment-word" matrix construction, its normalization, the use of singular value decomposition, and construction of proximity diagrams. Some conclusions obtained from this analysis are briefly outlined.

Keywords: LSA, political parties' manifestos, political position, mathematical model

MULTI-CRITERIA ANALYSIS

V.D. Noghin. Weighted sum scalarization in multicriteria optimization

Well-known method of the weighted sum of criteria is considered in a framework of the multicriteria choice model, including decision-makers strict preference relation, as well as a set of feasible alternatives and a vector criterion. The main point of the paper is a justification of this method for solving multicriteria problems. We analyze a class of problems in which using of the weighted sum of criteria may be considered as reasonable. Moreover, a combined approach is proposed. According to this approach we should to narrow the Pareto set by some information about the decision maker preferences and then to maximize the weighted sum of criteria on a subset of Pareto set.

Keywords: weighted sum, Pareto set, Edgeworth-Pareto principle, multicriteria optimization

V.V. Podinovski, A.P. Nelyubin. Potential non-dominance in choice problems with imprecise preference information

We study the problem of choosing the best alternative, in which the decision maker preferences are modeled by a family of partial quasiorders. The set of alternatives that pretend to be the best is sorted out, properties of alternatives from this set are studied and approaches to its construction are considered.
Keywords: decision making problems, partial preference relation, non-dominance, potential optimality, criteria importance theory.

E.M. Furems. The STEPCLASS method application for classification problems with hierarchical structure

The STEPCLASS method application for multicriteria/multiattribute classification problems with hierarchical structure is under consideration. Two approaches implemented in STEPCLASS for reducing a large-size classification problem to a problem with hierarchical structure – decomposition by attributes and decomposition by classes – are described. The examples of hierarchical structuring with STEPCLASS are given both for ordinal and nominal classification problems.
Keywords: Verbal Decision Analysis, multicriteria/Multiattribute classification, hierarchical structure, large-size classification problem, decomposition by attributes, decomposition by classes.

D.Yu. Kochin. Integrated approach to the elicitation of reliable expert knowledge

In the basis of implicit learning systems, that is the systems to teach diagnostics skills, there is expert knowledge base. Since expert knowledge can rarely be verbalized by an expert one have to use special methods for the knowledge elicitation. Besides all the knowledge in the base should be absolutely reliable because it is designated to be put at the root of the learning system. This article proposes integrated approach to the elicitation of the reliable expert knowledge using ordinal classification, isolation of class borders, revelation of decision rules and zones of unstable expert knowledge.
Keywords: expert system, expert knowledge, decision rules, learning systems, classification, implicit learning, decision analysis.