KNOWLEDGE ENGINEERING

A.E. Guskov, S.A. Shabelnikov, A.V. Vasilkov. Distributed data collection systems: principles of development based on the ontologies

In this paper the principles of distributed data collection systems development, which are based on formalized subject area description, are considered. Review of the ontology creating methods is done. Original method of the ontology creating is proposed. It can be used for building object, relational and hierarchical programmatic models and can be the base of the technology that separates the functionality of data collection system and subject area description.
Keywords: ontology, data collection systems, owl, xml

L.A. Pankova, V.A. Pronina. Semantic text retrieval based on fuzzy set theory

The crisp models of text retrieval do not take into account fuzziness of information.The fuzzy set theory provides means of handling fuzzy information. In existing works the theory of fuzzy sets is mainly used to represent ontologies and to introduce more flexible ways of formulating queries. In practice, text search models are still based on other approaches. In this area, the fuzzy set theory can offer elegant and intuitively attractive methods. In the paper the concepts of text retrieval are interpreted in terms of the fuzzy set theory. The models of text retrieval on the basis of the fuzzy set theory are proposed. The proposed models are based on the generalization principle and are intuitively simple. The generalization principle is the universal principle of the fuzzy set theory. In these models, the principle of generalization is used to move from relation between concepts towards relation between document and query, namely from relatedness of concepts towards the relevance of document to query. The paper presents the example that shows results of modeling.
Keywords: text retrieval, relatedness, relevance, fuzzy set theory, fuzzy relation, generalization principle

INTELLIGENT DATA ANALYSIS

M.G. Belyaev. Approximation problem for factorized data

We consider samples with factorial design of experiments (full or incomplete). Universal approximation methods don’t take into account peculiarities of such samples. We develop structural approximation method which is based on special function class and regularization. Optimal solution in this class can be found efficiently.
Keywords: nonlinear regression, factorial design of experiments, Kronecker product.

I.A. Bessmertny. Context approach to a quantitative assessment of information in knowledge bases

The paper concerns to the problem of a quantitative assessment for information capacity of knowledge bases and data bases. The key difference of the proposed approach from known methods is using of contest as a thesaurus of entities in a particular topic. Amount of information containing in elementary subject-object-predicate facts could be also calculated within the context. Some examples of information assessment for simple topics are presented.
Keywords: knowledge base, context, information capacity.

SIMULATION OF CREATIVE THINKING

V.L. Arlazarov, O.A. Slavin, V.V. Farsobina, A.G. Khovanskii. Find the best position by comparing digitated images

This paper describes the formulation of the problem of comparison of digitized (scanned) images. The theoretical problem of defining a parallel translation of the reference image, where it is the same as with the test image. Describes the computational experiments related to the analysis of binary image shifts. A comparison of the theoretical and heuristic methods for finding the optimal position of the images.
Keywords: image comparison function, the optimal position of the figures, the shift image

V.E. Nahapetyan, V.M. Khachumov. Automatic transformation of russian manual alphabet to digital text

The problem of sign language translation is considered for a set of gestures used in Russian manual alphabet (RMA). A hardware and software based system is proposed, which allows real time translation of static and dynamic gestures to digital text. Capturing of gestures is performed via 3D sensor of new generation Asus Xtion Pro Live. Machine translation is achieved by capturing depth images of human hand, processing and decomposing video sequence to key segments, where each segment represents individual gesture from RMA. Position of hand in depth image is determined via software platforms OpenNI and NITE. Hand configuration recognition is accomplished by converting hand image to geometric skeleton and comparing skeleton scans via dynamic time warping (DTW) algorithm. Gesture co-articulations are detecting by analyzing hand configurations in every video frame. The experiments show that developed system currently provides good quality of recognition for all static and some dynamic gestures used in RMA. The ways of further improvements for recognition of dynamic gestures are outlined.
Keywords: sign language translation, Russian fingerspelling, gesture recognition, depth image, 3D sensor.

MODELLING AND CONTROL

I.B. Tusseyeva, **D.B. Tusseyeva**, **Y-G Kim.** Global three-dimensional Dynamic Window Algorithm for AUV navigation.

In current paper the navigation method Dynamic Window Approach (1995) was developed for narrow marine world and extended to manipulate the vehicle in a three-dimensional (3D) space. It was tested using MATLAB and assessed as an effective obstacle avoidance approach for marine vehicles.
Keywords: Dynamic Window Approach, autonomous unmanned underwater vehicle, 3D environment, obstacle avoidance

GROUP CHOICE

A.Yu. Yurin. Application of group decision-making methods for case adaptation

The paper describes a case adaptation approach based on group decision-making methods. The proposed approach can be considered a new method of transformational adaptation in the context of planning. In planning, cases contain the solutions (as plans) for previous problems in the form of a completely or partially ordered sequence of actions (parts of a solution). Transformation operators transform existing plans into new ones that are reused in new situations. A detailed description of the approach and an example of its application for solving of the practical problem are presented.
Keywords: decision-making, case-based reasoning, group decision-making, adaptation.