

ABSTRACTS

Methods for an Arabic Optical Character Recognition¹

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Key words: optical character recognition, Arabic script, machine learning, clusterization.

One of the most well-known applications of artificial intelligence is the Optical Character Recognition (OCR). This technology has been widely used in various applications. Since recently, significant progress have been obtained for recognizing the Cyrillic and Latin alphabets. However, certain peculiarities of the Arabic make the application of similar approaches problematic. This paper reviews methods of the Arabic OCR with special reference to its graphic features.

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On the Consistency of Parameter Estimates of Fractional Order ARX Systems with Noise in the Output Signal¹

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Key words: Consistent estimation, least squares method, the difference between the fractional order.

An algorithm is proposed which is a generalization of the least squares method. It presents strongly consistent estimates of the parameters of fractional order ARX systems with noise in the output signal in the absence of information about the distribution of the noise.

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Topic Modeling and Clustering of Arabic Texts¹

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Key words: topic modeling, Arabic script, machine learning, clusterization.

Huge increase in the number of sources available online necessitates the development of efficient methods of characterization, classification, and indexing documents. Processing, modeling, and analyzing the text corpora are aimed at assisting the research. This paper reviews the approaches to modeling and clustering Arabic texts within the corpus.

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¹©N. A. Kizhaeva 2013

Resource Distribution in Multiagent Systems¹

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Key words: resource distribution, optimization, multiagent systems.

The paper provides a general description of various cases of a resource distribution problem in multiagent systems, areas of applicability, and overall introduction to existing solution methods.

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Euclidian Methods of Solution of Pseudoeuclidian Version of Traveling Salesman Problem¹

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Key words: mathematical model, traveling salesman problem, euclidian version, pseudoeuclidian version, geometrical approach, heuristics algorithm.

Euclidian traveling salesman problem (TSP) is one of the most extensively studied versions of TSP; over the decades of research, a lot of approaches have been proposed to solving this version of TSP. However, most of these approaches cannot be applied directly to other versions of TSP. In this paper, we consider one possible generalization of Euclidian TSP, so called Pseudo-Euclidian TSP, and develop a framework within which classical euclidian algorithms can be applied to solving the Pseudo-Euclidian TSP instances. We give a short description of the proposed algorithm and present some results of numerical experiments.

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Some Heuristic Algorithms for State Minimization of Nondeterministic Finite Automata¹

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Key words: nondeterministic finite automaton, universal automaton, state minimization, heuristic algorithm, iterative algorithm.

This article describes two approaches to the construction of heuristic algorithms for the problem of state minimization of nondeterministic finite automata. The first approach involves iterative reduction of the number of states by their combining. The second approach requires a prerequisite construction of a universal automaton. The results of computational experiments testify to possible applicability of both approaches.

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The Monte Carlo Method When the Probability of Transition is Determined by Interatomic Interaction Potentials¹

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Key words: Monte Carlo method, molecular dynamics method, simulation of nanocrystal growth, simulation of crystal structure.

In this paper we propose a modified Monte Carlo method for simulating the crystal growth; it determines the binding energy of atoms occurring through the interatomic interaction potential. The interaction potential is chosen according to the algorithm used in the method of molecular dynamics. The proposed algorithm is able to create laid knowingly larger number of cells than the number of lattice sites. Due to this, there is a possibility of obtaining different crystal structures with a change in the simulation. Thus, the simulation algorithm allows for a reconstruction of the lattice structure and changes in the coordinates of the nodes in the process of crystal growth.

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On the Optimization Algorithm of Crystal Growth Calculation by Monte Carlo Simulation¹

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Key words: Monte Carlo method, simulation of crystal growth, probability vector for event groups.

We propose a Monte Carlo simulation of crystal growth when the parameters of the physical quantities can greatly vary at the simulation increasing significantly the number of events. To optimize the calculation we propose the algorithm which groups events according to various criteria. The probability of each event is recorded as a vector whose first coordinate the actual probability of the event, and rest coordinates are numbers of groups to which the event is corresponded. Probabilities of event groups occurrences are determined when initializing. The choice of a specific event at the modeling is made sequentially: a group selects at first, an event within the group selects at second. Groups can be nested within each other. The fact an event occurs or not is determined at the end of the algorithm. The algorithm allows to speed up settlements in 40 or more times.

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On the Optimal Caching of FIFO-Queues¹

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Key words: FIFO-queues, dynamic data structures, mathematical modelling, caching.

This paper presents a mathematical model, in the form of a random walk on the integer lattice in the triangle, and the optimal algorithm for FIFO-queue control in a two-level memory. Assume that we work with the queue whose length may exceed the size of the fast memory. In this case, we transfer part of the elements located at the end of the queue to the memory on the second level and insert and delete items in the fast memory. In the case of a new overflow or underflow of the oldest items in the fast memory, we perform a redistribution between the levels of the memory to preserve the FIFO discipline and minimize the average number of the queue reallocations, which is equivalent to the maximization of the time between redistributions of the queue.

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Optimal Partitioning of Shared Memory for Two Parallel FIFO-Queues¹

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Key words: FIFO-queues, dynamic data structures, mathematical modelling.

In this paper we propose a mathematical model and solve the problem of optimal partitioning of shared memory for two FIFO-queues for the case of consecutive cyclic implementation where insertion (deletion) of an item in the queue is performed at odd (respectively, even) steps of discrete time. Along with sequential execution, it is possible to execute operations with queues, with given probabilities, in parallel.

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Use of Randomized General Hough Transform in the Object Identification Problem¹

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Key words: Hough transform, identification, randomization, edge detection.

The randomized general Hough transform is introduced with application to the faster object identification of the noisy images from camera.

Bibliogr.: 5 refs.

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