

## 4. INFORMATION AND COMPUTER TECHNOLOGIES

### *Abstracts*

*Aleksanenkova A. A.* **Computer simulation of the University business processes**

This article deals with the University business processes modeling. Considered technologies are applied to construct the models. Also, descriptions of criteria of a choice and feature of their use are performed. A great attention is paid to the BPwin case-mean and standards that are supported in it. The University definite division modeling is made. The tasks, which can be executed based on received results, are described.

*Anisimov D. V.* **Deduction problem solution using DNA properties**

The article deals with some aspects of implementation of new computing paradigm based on DNA to solve one of the famous problem, namely, the verification of propositional formulas on feasibility and validity. The problem is solved in private case for several variables using main DNA properties such as an ultra high density of molecules packing and complementarity property. The author considers prospects of using DNA properties within the limits of calculation for the purpose of further practical application of DNA-calculations for the NP-full problems solving.

*Balmyshev A. N.* **Usage of semantic model of natural language in automated learning systems**

In the paper the usage of semantic model of natural language in automated learning systems is described.

*Bochkarev P. A.* **Statistical algorithm for the Boolean data and its application in the Role Mining problem solving**

The author proposes basic definitions and concepts of role engineering and state the Role Mining problem as one of finding of the optimal set of roles. The problem is reduced to finding a binary matrices decomposition. It is proposed to use a probabilistic model and construct the likelihood function. An algorithm based on gradient method that maximizes the likelihood function is proposed.

*Wang Hongbo.* **Synthesis of dynamic correctors for course stabilization accuracy increasing**

The article deals with the problem of choice of correctors in multi-purpose structure that provide desired quality of course stabilization when moving in the conditions of sea roughness. The simple method of its construction is offered. The algorithm of optimum dynamic corrector synthesis is proposed.

*Glazova M. A.* **Automatic marking of training set documents for the problem of name entities extraction**

The article presents the analysis of automatic partitioning of a training set for the problem of name entities extracting from a text using the method of maximum entropy. Automatic marking is based on two different dictionaries of name entities. The results comparison is made.

*Dolgopolik M. V.* **Convex hull construction in arbitrary dimension space**

In the article, convex hulls of finite number of points in arbitrary finite dimension space are considered. The problem of extreme points finding is solved. If dimension of convex hull is equal to the space dimension, a new solution algorithm of the problem is proposed. In case of mismatch of dimensions, the way of transformation to the space of smaller dimension is treated. Geometrical interpretation of algorithm and its possible advantages in comparison with existing algorithms of convex hull construction are considered.

*Drokin I. S.* **Computer algorithms for ultrastabilization of LTI systems**

The problem of feedback constructing by the output of a linear stationary object that provides an ultrastable closed-loop system is considered. Two computational algorithms of problem solution that are easily implemented in MATLAB are proposed. A comparison of proposed approach with an algorithm that forms a stabilizing control is performed.

*Durnovtseva S. A.* **Computer modeling of a deep-diving vehicle dynamics under step disturbances**

Lateral drifts of deep-diving vehicle analysis with a switched-off mid-flight engine are considered. The stabilize control that provides lateral drift astaticism of closed loop system is designed. The computer model of a deep-diving vehicle dynamics under step disturbances is constructed. The results are performed.

*Zhuravlev M. M.* **Empiric approach to select of clusters number in the problem of identification of mechanical destructions of image**

In the article, the problem of calculating of surface cracks characteristics is solved by means of pattern recognition and data clustering. Using of the pattern recognition and data clustering for solving this problem shows perspectives of applying this method to solve problems of this type. Results of numerical experiment are given. An empiric criterion of recalculation is given.

*Ivanov A. N.* **Neural networks training problems in dynamic objects control and algorithmic foundation of its solving**

The problems of neural networks training in control process are considered. The method based on genetic algorithm is described for solving optimization problems. This algorithm makes it possible to avoid difficulties that arise from using of gradient methods of optimization and gives an additional opportunity to analyze the neural network control systems. A comparison of considered methods of training is shown by example of water tank level control.

*Ivanova O. A., Kudryashova E. A.* **Analysis of SQL-Queries optimization in the Oracle DBMS**

In the article, problems of SQL-Queries optimization in the Oracle DBMS are considered. On the assumption of performed applied experiments with SQL-Queries maxims for optimum realization of SQL-Queries are obtained.

*Kanifolskiy D. S., Nesterov A. V., Nesterov S. V., Tsapov G. M.* **On problems of numerical solving of the Cauchy problem with application of the linear automatic control system simulation in MATLAB**

In the paper, the authors perform results of research of MATLAB computing ability in solving of the Cauchy problem for the first-order ordinary differential equation (ODE) system, describing the dynamic processes in linear systems of automatic control. Numerical experiment is carried out, and the modified ODE stiffness criterion is suggested based on it.

*Komlev S. N.* **Methodology of the MATLAB software application to the C++ visual programming environment**

In the article, a methodology of the MATLAB software application to the C++ visual programming environment is considered. The aim is to develop a new approach to construction of various stand-alone Windows-based applications that demand a broad range of tools, algorithms, procedures and functions of advanced mathematics and user friendly interface. The approach is illustrated on the example of MATLAB 6.0 and Borland C++ Builder 6.0. The method of dynamic-link library assembling and its application to the Borland C++ Builder visual developing environment are discussed.

*Korovin A. S., Korolyov A. I., Timoshenko D. M.* **Algorithm of formative speech signal frequency finding**

In the paper the algorithm of formative speech signal frequency finding is offered.

*Krivsov E. A., Kolpakovich K. Yu.* **Method of optimization of modern ERP systems**

The article deals with ideas of new direction creation in the ERP systems and advantages of its using in corporate IT systems. New system has a universal modular structure that makes the integration faster without big financial support. Modular ERP system is easy in usage and integration; it uses mathematical methods and has all privileges of simple ERP systems.

*Martushov I. A.* **Analysis of genetic algorithms**

In the article, the local optimum problem of genetic algorithms is considered for the regular GAs. New design of mutation and crossover operators is suggested. The design allows avoiding algorithm convergence to local optimums without working time increasing.

*Melnikov D. V.* **Semantic transformation of natural language queries to relational structures**

The article deals with semantic transformation of natural language queries to relation structures. Basic problems and possible solutions of such kinds of transformations are shown. Examples with step by step calculations of semantic analysis system are given. The aim of article is to show an appropriate way to transform natural language queries to structured query language.

*Okunev V. V., Potapov A. S.* **Prior estimate of block sizes influence on decoded image quality for fractal image compression algorithm**

The classical fractal image compression algorithm for grayscale images is considered. A notion of average spatial period is introduced for prior estimate of decoded image quality. The empirical rule of determination of optimum size of range block is given is obtained. Obtaining is illustrated by examples.

*Panov S. A.* **Conception of construction of systems**

In the article conceptions of construction of systems are considered.

*Petrov R. A., Fuks V. V.* **Identification of features for news documents classification by means of the support vector method**

In the paper identification of features for news documents classification by means of the support vector method is described.

*Savin A. V.* **Identification and control of position of horizontal pendulum in real time**

In the article the problems of identification and control of position of horizontal pendulum in real time are considered.

*Sarnatsky M. V.* **Method of iterative adaptation of automatic speech recognition systems to a speaker**

In the article, the problem of adaptation of automatic speech recognition systems to a speaker is investigated. The main idea of suggested method of iterative adaptation is the sequential adaptation of recognition system using most likely recognized elements in input data. This method allows adapting for unknown input data and can be applied continually during the speech recognition process. Also, the vowel recognition algorithm for Russian language including the iterative adaptation method is described.

*Smirnov M. N., Fedorova M. A.* **Computer modeling of the astatic stabilization system of sea-going ship course**

In the article, some problems associated with computer methods of modeling and synthesis of automatic control of sea-going ship at given course are considered. The problem of choosing of parameters of PID-controller that provide desired dynamics of closed loop system is the basis of proposed approach. The MATLAB-Simulink system is used as the basic tool of computer support. An example is given.

*Spiridonov S. S.* **Comparative analysis of calculation performance formulas between the program MS Excel and algorithm of dynamic forest**

The graph theory is used in many applications with hierarchical structure. An algorithm of dynamic forest increases the performance of such applications much more. It is completely independent; it allows calculations distributing and memory usage controlling. In the article this algorithm applied to MS Excel formulas calculations is considered. The comparison tables of calculation performance for different formulas and actions are also performed.

*Terentiev S. V.* **On application of interval methods to the construction of pseudo-trajectories**

In the paper, the author uses methods of interval arithmetic to construct pseudo-trajectories passing through two given points. The result of computation is a sequence of intervals such that any sequence of points taken one by one from the intervals is an  $\epsilon$ -trajectory for some obtained in the solution process. For continuous systems, the 4th order Runge–Kutta interval method designed and introduced by Shokin U.I. is used. The results of numerical experiments are performed.

*Urbanovich S. Yu.* **XPath realization by means of monoid**

Extensible Markup Language (XML) is one of the most common data markup languages. There are some data processing problems in the xml format. One of the problems is a matching by pattern. To simplify solving of this problem, the XPath query language was invented. In the paper, the XPath realization by means of monoids is considered.

*Shelabin D. A.* **SGM-algorithm for moving object detection in video stream**

The article is devoted to one of the most effective algorithm for active regions detection used in video surveillance systems for object tracking. The significant features of this approach are described in order to generalize the results obtained.

*Hara T., Brine J.* **Data mining techniques to evaluate use patterns of a learning management system**

Learning Management Systems (LMS) are now widely used in university teaching. There are numerous strategies that suppose LMS to be applied, such as blended learning and distance education. Given the variety of application strategies, it's quite difficult to estimate the effectiveness of LMS. In this paper, the authors describe a brief overview of a possible method for evaluating the patterns of usage and effectiveness of LMS by applying of data mining techniques to students' usage log files from the Moodle Learning Management System. The log files are from several language courses offered at a university in Japan specializing in computer science engineering.