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Contents

Examples of countable models of a weakly o-minimal theory
A. Alibek, B.S. Baizhanov

The development of semantics model in machine translation of the kazakh language
D.R. Rakhimova

Modelling on the computer of radiating processes in the copper irradiated by various ions
Sh.E. Jeleunova, A.I. Kupchishin, T.A. Shmygaleva, A.A. Nietkaliev

Methods of database optimization in production
B. B. Kudaibergenov, Sh. Zh. Mussiralieva

Genetic algorithm of the batch processing of the request stream in grid system
A. Kuandykov, N. Saparkhojayev, S. Rakhmetulaeva

About noetherian of Riemann-Hilbert's problem for general Cauchy-Riemann's system
J.A.Tokibetov, S.Z. Sapakova

Free/open-source rule-based machine translation between english and kazakh: first steps
A. Shormakova and M.L. Forcada

Tasks and principles of complex objects coordination resources control
R.K. Uskenbayeva, A.A. Kuandykov, A.U. Kalizhanova, Ai.A. Kuandykov, T.S. Kartbayev, B.S. Akhmetov

Computer modeling of the kinetics of phase transformations in thermochemical cathodes
A.D. Kadirova, A.A. Kavokin, Badr Munir

A calculation of 3-d model of ground water flux at evaporation from water table using parallel algorithm mpich
Masroor Hussain, V.A. Mychkin, A.A. Kavokin

Quadrupolar gravitational fields described by the q – metric
H. Quevedo, S. Toktarbay, Y. Aimuratov

Microfield distribution in semiclassical plasma
T.S. Ramazanov, M.C. Jelbuldina, К.N. Dzhumagulova

Peculiarities of nuclear and photonuclear reactions in crystalline structure of neutron star crusts
N. Takibayev, K. Kato, A. Sarsembayeva, M. Takibayeva, D. Nasirov

Exact Lattice Supersymmetry
Alessandro D'Adda

Dielectric properties of two component coulomb modeled plasmas
Yu.V. Arkhipov, A. Askaruly, A.B. Ashikbaeva, A.E. Davletov, A.T. Burtebayev, I.M. Tkachenko

Investigation of turbulent heat and mass transfer in high- and chemically reacting flows
A.S. Askarova, S.A. Bolegenova, V.Ju. Maximov, A. Bekmuhamet, M.T. Beketaeva

Investigation of formation of burning harmful emissions at methane
A.Askarova, S. Bolegenova, V. Maximov, A. Bekmuhamet, Sh. Ospanova, M. Beketayeva

Features of the structure and surface properties of nanoporous alumina
Kh.A. Abdullin, B.A. Alpysbayeva , Zh.K. Kalkozova

Alpha cluster transfer in $^{16}O+^{12}C$ at energy 41.3 MeV
M. Nassurlla , V. Dyachkov, T.V. Arkhipova, N. Burtebayev, J. Burtebayeva, A.K. Morzabayev, S.K. Sakhiev, K. Rusek, E. Piasecki, S. Kliczewski, S.B. Sakuta, Sh. Hamada, S. Torilov

Second harmonic generation in dissipative metamaterials
Ye. S. Mukhametkarimov, Zh.A. Kudyshev, A.E. Davletov, I.R. Gabitov and A.I. Maimistov

The influence of electron irradiation on the structure of nanosized metal particles
M.Zh. Buranbaev, B.A. Aliev, U.P. Koztaeva, G. Partizan, Zh. Entibekov, Zh. Nakysbekov

Determination energy spectrum – – and – molecular ions with orbital excitation
M. Dineykhan, S.A. Zhaugasheva and A.K. Bekbaev

Forced dynamics of oscillator ensembles with global nonlinear coupling
A.A. Temirbayev, Y.D. Nalibayev, Z.Zh. Zhanabaev, V.I. Ponomarenko, M. Rosenblum

Examples of countable models of a weakly o-minimal theory

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Abstract. In this paper we consider the class of weakly o-minimal theories. A model is called weakly ominimal if every definable subset can be represented as a finite union of convex sets. We say that a theory is called weakly o-minimal if all models of this theory are weakly o-minimal. We effectively show that there is a weakly o-minimal theory with finite and countable number of models. The result is loosely based on the proof of Laura L. Mayer of the Vaught conjecture for o-minimal theories. In a way, this article is a case of the Vaught conjecture for weakly o-minimal models. We prove that the number of countable models of a weakly o-minimal theory has a finite and a countable number of models by considering an inductive example of a theory with order. It is inductive due to the change in the number of predicates of our signature. Hence we consider the formulas and types that arise in these examples.
Keywords: Model theory, Number of countable models, Weakly o-minimal theory, Vaught conjecture.

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The development of semantics model in machine translation of the kazakh language

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Abstract. In work the approach to semantic representation in machine translation of a natural language with use of the augmented attribute grammar offered by the example of the Kazakh language as initial. The essence of the offered approach consists in creation for each sentence of initial (Kazakh) language a ontology, which is used for formation of the text of the sentence of target (Russian, English) language. For representation of ontology offers the formalism of the augmented attribute grammar which feature is inclusion of special semantic rules in view of features of initial (Kazakh) language at a level of representation of words, phrases and the sentence is offered.
Keywords: natural language, kazakh language, machine translation, semantics, attribute grammars.

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Modelling on the computer of radiating processes in the copper irradiated by various ions

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Abstract. Processes of radiation formation of defects in the copper irradiated by various ions are considered in work. To carry out calculations specifically under the formula for cascadely – probabilistic functions (CPF) it is impossible, as in each factor there is an overflow and so the algorithm has been developed for calculation of cascadely - probabilistic functions depending on number of interactions and depth of penetration of particles. The algorithm of calculation is presented in the form of the block diagram. The CPF computations, concentration of radiating defects are lead, the regularities arising at the fit of approximation coefficient, at calculations of cascadely - probabilistic functions, concentration of radiating defects at an ionic irradiation in copper are revealed.

Keywords: Cascadely - probabilistic functions, concentration of radiating defects, approximation coefficient, ion, copper.

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Methods of database optimization in production

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Abstract. Database optimization is the valuable improvement of system in production. Nowadays, as long as we have got physical acceleration of calculations we also got another type of problem – big data processing. This article contains most popular types of optimizations. Optimization is an abstract thing, as soon as we can't say that this method is the best for all cases. There are many cases when particular type of optimization can hurt our production speed. In our project of modeling genealogical tree we met such problems as slow speed of queries on Mysql database. Then we followed some steps that increased the speed of the database up to several times.
Keywords: Database optimization, database indexing, high load data processing, methods of database optimization.

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Genetic algorithm of the batch processing of the request stream in grid system

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Abstract. In this given research paper, the process of servicing flow applications in GRID-system is considered. For solving this problem, the genetic algorithm is constructed, the procedural operators of which are defined on the basis of the experimental analysis for problem-solving process. The efficiency of acquired genetic algorithm is tested on the test examples. The experiment has shown the best result comparing to other algorithms.
***Keywords**:* Distributed computing, GRID system, a genetic algorithm.

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About noetherian of riemann-hilbert's problem for general cauchy-riemann's system

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Abstract. This paper consider the Riemann-Hilbert's problem for the system of generalized Mouisil- Teodorescu in half of E. This problem is reduced to a Fredholm integral equations by the Bouligand- Giraud's method. Subject to the special conditions of the problem of finding two regular in D σ and τ harmonic functions is solvable, if you are not more than a finite number of orthogonality conditions imposed on the functions f_1 , f_2 depending on the number of linearly independent solutions of the homogeneous problem defined Noether problem for the system (1).
Keywords: Cauchy-Riemann's system, homogeneous, Noether problem, Riemann-Hilbert's problem, Bouligand-Giraud's method.

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Free/open-source rule-based machine translation between english and kazakh: first steps

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Abstract. This paper describes the first steps in the project of building a prototype of a free/open-source rule-based machine translation system that translates from English to Kazakh, which is based on the free/open-source Apertium machine translation platform. The choice of a free/open-source model is motivated by the objective of providing a free/open-source English to Kazakh system that could be used and modified by anyone interested, and uses, unlike other systems available for this language pair, a welldocumented rule- and dictionary-based translation procedure. After a survey of the first problems of English→Kazakh translation tackled, a description follows of: (a) the Apertium platform and the use of the Helsinki finite-state toolkit to model Kazakh morphology, (b) the methodology and the initial resources used to build the linguistic data needed (English and Kazakh monolingual dictionaries, bilingual dictionaries, structural transfer rules), (c) the current status of the resulting system, (d) its availability as free/open-source software, (e) a list of immediate steps to take, and (f) a description of long-term development planned, which includes the use of the system in computer-aided and interactive translation environments for professional translators. A preliminary comparison to two existing commercial English–Kazakh systems, using examples covering the linguistic phenomena for which structural transfer rules have been written (processing of short noun phrases, verb phrases and adpositional phrases) is also provided; the comparison shows that a principled rule-based approach may be expected to easily improve the results of existing commercial systems for English→Kazakh and motivates the effort for future development.
Keywords: English, Kazakh, machine translation, rule-based, free/open-source software.

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Free/open-source rule-based machine translation between english and kazakh: first steps
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Tasks and principles of complex objects coordination resources control

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Abstract. It is noted in the work that for complex objects control there is required the efficient use of control systems resources: computational, informational, monitoring. In that connection there is given resources control task formulation in the form of optimization problem. The given problem is named as the coordination task and there is offered the methodology of its solution. It implements the problem solution based on assumed model reflecting the states and interrelations of factors in the control problem environment.
Keywords: Complex objects cordination, cordination resources control, tasks of complex objects coordination, principles of complex objects control, optimization problems;

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Computer modeling of the kinetics of phase transformations in thermochemical cathodes

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Abstract. In this paper the mathematical model for calculation of coordinates of a free boundaries between phases of substance by heating and fusion taking into account kinetics of phase transformations is presented. The model is applied to determination of temperature and a phase state in a zircon insertion into the cathode of the plasmatron. In contrast to known Stefan's problem , in offered model there are no difficulties in cases of appearance of the new phase domain or phases disappearance. For determination of the phases free boundaries instead of a Stefan's conditions the state diagrams are used. Such approach allows avoiding some difficulties of numerical calculations of normal derivatives at unknown phases' boundaries. For determination of coefficients of kinetics it is offered a method of comparing of the numerical solution of one-dimensional model with the known exact self-similar solution of the Stefan problem. Some results of calculations are presented and discussed.
Keywords: Stefan's problem, free boundary, computational modeling of phase transformations, kinetic of phase transformation, thermo-chemical cathodes.

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A calculation of 3-d model of ground water flux at evaporation from water table using parallel algorithm mpich

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Abstract. This paper discusses the calculation of distribution of hydraulic head *H (x, y ,z),* in flux of ground water which is described by the well-known equation: . In order to investigate the influence of the variation of values *K* (filtration coefficient) and rate of evaporation *Q* from the surface of ground water, were used especial nonlinear conditions on unknown ground water surface *S(x,y)*. An iterative algorithm for a numerical solution of the finite-difference approximation using known Richardson's relaxation method has been developed and then converted to parallel algorithm for calculation on multi-processors architectures. Variants, when there is in ground water a finite area with very small filtration coefficient (e.g. a layer of clay) are discussed. It has been shown by calculation that on above mentioned finite area, a local depression of water surface can be formed. An approximate 58% efficiency in time was obtained by computing using 4-processes cluster and MPI.
Keywords: Water flow free boundary problem, ground water table determination; numerical methods, parallel computing algorithms, message passing interface.

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Quadrupolar gravitational fields described by the $\tilde{q}$ metric

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Abstract
We investigate the Zipoy-Voorhees metric ($\tilde{q}$ metric) as the simplest static, axially symmetric solution of Einstein's vacuum field equations that possesses as independent parameters the mass and the quadrupole moment. In accordance with the black holes uniqueness theorems, the presence of the quadrupole completely changes the geometric properties of the corresponding spacetime that turns out to contain naked singularities for all possible values of the quadrupole parameter. The naked singularities, however, can be covered by interior solutions that correspond to perfect fluid sources with no specific equations of state. We conclude that the $\tilde{q}$ metric can be used to describe the entire spacetime generated by static deformed compact objects.

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Microfield distribution in semiclassical plasma

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Abstract
In this article the calculation and analysis of the plasma microfield distribution function with taking into account of the quantum effects of diffraction and the screening effects are presented. On the basis of this microfield distribution optical properties of plasma are investigated.

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Peculiarities of nuclear and photonuclear reactions in crystalline structure of neutron star crusts

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Abstract
Nuclear reactions in three-body systems consisted of neutron and two heavy nuclei, the influence of neutron resonances on the peculiarities of effective interactions between heavy ions and the appearance of the new type of few-body resonances in crystalline structures of neutron star crusts are considered.

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Exact Lattice Supersymmetry

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Abstract
A new formulation of exact supersymmetry on the lattice, based on a different approach to the lattice fermion problem, is reviewed. Supersymmetry is realized on an extended lattice, made of different copies of the original lattice connected by links which are associated to supersymmetry transformations. Each degree of freedom on the lattice corresponds then to more degrees of freedom in the continuum, which however are all part of the same supermultiplet. Species doublers of the lattice fermions find a natural interpretation in this context. Conservation of the sine of the momentum, rather than of the momentum itself, is required, and that leads to a non local theory. Locality is however recovered in the continuum limit. The case of the model with $N = 2$ supersymmetry in one dimension is reviewed in some detail.

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Dielectric properties of two component coulomb modelled plasmas

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Abstract
A method for calculating the dynamic collision frequency(DCF) [1] and the dielectric function(DF) in the two-component model plasma, with an effective Coulomb interaction potential, taking into account the spatial dispersion within the method of moments and the modern approach to the calculation of the Nevanlinna parameter function, is proposed.

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Investigation of turbulent heat and mass transfer in high- and chemically reacting flows

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Abstract

There were researched processes of heat mass transfer by burning of pulverized coal on the sample of combustion chamber BKZ-75 of Shahtinsk TPS by using of 3D Modeling technologies on the basis of differential equation solution of turbulent reacting flows. Got distribution of vector components of full speed in different sections of combustion chamber, given dependence of velocity vector to the height of combustion chamber, obtained temperature profiles and its distribution on the height of combustion chamber. Set minimum and maximum values of given variables, shown dynamics of changing of given characteristics in the volume of investigated combustion chamber.

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Investigation of formation of burning harmful emissions at methane

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Abstract
The present paper is devoted to the study of the influence of the speed of cocurrent oxidizer flow on the concentration of carbonic gas at methane burning in the flat channel.

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Features of the structure and surface properties of nanoporous alumina

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Abstract. Nanoporous alumina widely used as membranes, that have very good technical characteristics. Nanoporous alumina film prepared by two step anodization method. Process of anodization allows the generation of stable patches of nanoporous alumina and can affect the size and depth of the nanopores. Surface of alumina film and its surface properties were researched on atomic force microscopy (AFM).
Keywords: Nanoporous alumina film, anodization, oxalic acid solution, AFM image, SEM image.

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Alpha cluster transfer in 16O+12C at energy 41.3 MeV

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Abstract

The angular distribution of the elastic scattering of 16O ions on the nuclei 12C were measured on heavy-ion accelerator of Warsaw University at energy of 41.3 MeV in the laboratory system. Differential cross sections for elastic scattering of ions 16O on 12C in the forward hemisphere is described by the standard optical model, while at the same time, a significant rise of the cross section of elastic scattering in the backward hemisphere can be reproduced with taking into account the contribution of alpha-cluster transfer mechanism.

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Second harmonic generation in dissipative metamaterials

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Abstract
In the regime of continious waves the second harmonic generation process in dissipative negative refraction-index metamaterials is considered. In analogy with an ideal lossless case it is shown that the magnitude of the phase mismatch determines two possible types of the intensity distributions of the fundamental and the second harmonic waves in the medium. At small values of the phase mismatch the intensity distributions of both the fundamental and the second harmonic waves are monotonic functions of coordinates. But if the phase mismatch reaches some critical value, the intensity distributions of the two waves undergo a transition from monotonic to oscillatory pattern. The influence of the losses in the medium on that critical value of the phase mismatch is numerically studied.

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The influence of electron irradiation on the structure of nanosized metal particles

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Abstract
The structure of nano-sized copper powders, before and after irradiation with high-energy electrons in the dose range 1-10 Mrad, has been studied using the methods of electron microscopy, smallangle X-ray scattering and X-ray photography. New structural phases with different lattice types and parameters have been detected.

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Determination energy spectrum H_2^+ ,D_2^+ and T_2^+ molecular ions with orbital excitation

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Abstract

On the basis of the investigation of the asymptotic behavior of the correlation functions of the corresponding field currents with the necessary quantum numbers the analytic method for the determination of the energy spectrum of the three-body Coulomb system is suggested. In the framework of this analytical approach we determine the energy spectrum of the molecular hydrogen ions with orbital excitation. In our case, relativistic corrections are taken into account by the constituent mass of the constituent particles, as well as by the interaction potential. Our results showed that the masses of the constituent particles differ from the masses of the particles in the free state. The insreasing of constituent mass of the electron is comparatively larger than the insreasing of constituent mass of the proton, deuteron and triton. Found that the constituent masses of the electron for the molecular ions of hydrogen H_2^+ ,D_2^+ and T_2^+ are different. Thus, our results on the energy spectrum of molecular hydrogen ions very well agreement with existing results of a precision spectroscopy, this is achieved, taking into account the value of the constituent masses of particles.

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Forced dynamics of oscillator ensembles with global nonlinear coupling

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Abstract

We perform experiments with 72 electronic limit-cycle oscillators, globally coupled via a linear or nonlinear feedback loop. While in the linear case we observe standard Kuramoto-like synchronization transition, in the nonlinear case, with increase of the coupling strength, we first observe a transition to full synchrony and then a desynchronization transition to quasiperiodic state. In this state the ensemble remains, however, coherent so that the mean field is non-zero, but mean field frequency is large than frequencies of all oscillators. Next, we analyze common periodic forcing of the linearly or nonlinearly coupled ensemble and demonstrate regimes when the mean field is entrained by the force whereas the oscillators are not.

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