Summaries of all articles

S. B. Vasilyev, N. P. Pilnik

US banking system model: description of the 1970–2010 transient processes

The article presents a relatively simple model of the US banking system describing its evolution from 1973 to 2013. In the model the macroeconomic agent – bank manages paths of consumer and mortgage loans, internal and external deposits and securities on the balance sheet in order to maximize the utility function of the above dividends paid. describes the solution to the bank problem for different values of parameters and initial conditions is found. On the basis of the official American statistics the variables, that form the aggregate balance of the banking system are calibrated. The calculation by the model dynamics of the main variables allows a high degree of accuracy to describe transient processes that take place in the development of the US banking system.

Key words: US banking system, Federal Reserve, loans, deposits, economic crisis.

D. V. Volodin, T. A. Vaskovskaya

Determination of local markets occasioned by congestions on electricity markets

This paper offers a new approach for determination of congestion zones formed by transmission constraints on wholesale electricity market for further retrospective economic analysis. The approach can be used for nodal auctions with AC optimal power flow models and calculations of locational marginal or nodal prices. Analysis is conducted on power transfer distribution factors obtained from price decomposition. The paper proposes two online clustering algorithms and gives the method of determination of congestion zones margins estimates that are stable in long term periods. Determined congestion zones can be used for market power mitigation and general network infrastructure development.

Key words: clustering algorithms, transmission constraints, congestion zones, market power.

V. P. Vrzheshch, I. G. Pospelov, I. V. Sannikova

Modeling Russian households

An intertemporal model of rational macroeconomic Household is developed. The model allows simultaneous loans and deposits increments. Four types of commodities are introduced: interior and imported, short-term and long-term ones. The model is calibrated by the 2004–2012 Russian macroeconomic data.

Key words: household, loans, deposits, macroeconomic data, intertemporal equilibrium.

A. A. Zhukova, I. G. Pospelov

Stochastic model of savings with the inertia of consumption

In this paper, a technique developed in the study of a model of illiquid commodity trade is applied to the analysis of a stochastic model of optimal consumption with variable income and an additional assumption of the assets dynamics (the so-called liquidity constraints). Among possible problem statements with various forms of liquidity constraints in the form of an inequality and a penalty in the optimized functional, the latter form is particularly useful for calculation of macroeconomic models of intertemporal equilibrium. Therefore, this study focuses on finding the penalty that ts convenient for calculations and analysis and replaces the direct restriction. The equations defining the solution of the agent's problem are derived and then investigated using the method of characteristics. It is shown that, firstly, as in the previous problem, the solution has a special mode near the planning horizon, and, secondly, there is a dependency between penalties for the phase varible within the planning interval and its final value.

Key words: optimal control, phase constraint, Markov control.

N. I. Klemashev, A. A. Shananin

Nonparametric analysis of budget statistics

We consider the problem of computing economic indices under violation of rationalizability conditions. We suggest a heuristic approach for solving the problem of splitting households into the minimum number of social classes for which the economic indices exist. This approach is applied to the budget statistics of United Kingdom. The obtained split of households has a clear economic interpretation.

Key words: Konüs-Divisia indices, nonparametric method, trade statistics, budget statistics.

D. I. Malakhov, I. G. Pospelov

Evolution of the distribution of Russian banks on key aggregates

In this paper, we propose a model of interaction between banks that make up the banking system of some open economy. The purpose of this work ts to describe the evolution of the banking system on the key economic indicators. As an example of such an indicator, bank's assets are used. It is expected that the new money in the banking system can be created either through loans from outside the banking system or by credit issue. Withdrawal of funds from the bank occurs only as a result of bank debt (in the first case) or debt relief to the client (in the latter case). The model assumes that the issue brings to maturity interest income or expense. The paper theoretically shows that the growth of the banking system as a whole and the evolution of the distribution of shares of each bank's assets in total assets of the banking system are two fundamentally different processes.

Key words: bank, banking system, credit issue, bank's assets

I. S. Menshikov

Laboratory analysis of the influence of context on decision making

The problem of determining the operating range of the stabilographic method in the research the human functional state in the decision-making process is studied. The results of the experiments using the hardware-software complex of 10 stabilographic chairs are investigated. Three classes of the laboratory tasks decision in accordance with the level of cognitive load on the test are introduced. It is shown that for all three classes the stabilographic method is efficient in analyzing the influence of context on the decision-making process.

Key words: decision making, attitude to risk, laboratory game, stabilography, functional status, prospect theory.

N. P. Pilnik, I. P. Stankevich

Multiproduct model decomposition of the components of Russia's gross domestic product

of indices. The main distinguishing feature of the proposed decomposition is the lack of reference to the export or import, which solves the problem of incompatibility of the final system of equations and removes the restrictions on the behavior of export and import deflators. A theoretical basis for the procedures is provided, the method of calculating the statistical data is described and the results of the procedure of data decomposition of the components of Russia's GDP is presented. The resulting two-product decomposition is valuable not only as an intermediate step in the construction of macroeconomic models, but it also allows a number of conclusions on the behavior of macroeconomic agents. The paper also provides a method of decomposition of changes in inventories, which, because of the nature of this indicator in economic models, are usually ignored.

Key words: Russia's economy, elements of GDP use, decomposition, consumption, investment, inventories.

I. I. Pospelova, N. M. Novikova

Compromise in multicriteria games with opposite interests

In this paper, we investigate the problem of defining the multicriteria two-person game solution. In such games, each player has a payoff in the form of a vector function. Traditional game-theoretic concepts formally used in the case of several criteria estimates of payoff are not satisfactory. We present an absolutely new idea of equilibrium in a multicriteria game based on a nonformal and essential approach.

Key words: multicriteria games, equilibrium, compromise, vector payoff function, best guaranteed result.

A. N. Burmistrov, V. P. Kovalev, G. B. Sizykh

Maximum principle for the solution of an elliptic equation with unbounded coefficients

A sufficient condition of applicability of maximum principle to solutions of linear partial differential equations of elliptic type with unbounded coefficients at first-order derivatives is found. Those equations usually arise when investigating axisymmetrical processes in a cylindrical reference system.

Key words: maximum principle, cylindrical reference system, axial symmetry.

Yu. M. Gektin, A. A. Zaitsev

Development and application of a modified median filtering algorithm for airborn remote sensing image correction

The algorithm for clearing digital images of the Earth remote sensing from lengthy additive interference is described. The algorithm is based on the principle of median filtration. Its advantages are compared with a standard method.

Key words: additive interference, median filter, digital image, one- and two-dimensional array.

A. A. Domynian

Software tools for gesture recognition

We study the problem of gesture recognition. For preprocessing scene, we choose the method of picture difference and ubject shaping and select three levels to solve the problem. We also describe the features extraction method, positional distance functions and suggest the method for machine learning of the system.

Key words: gesture recognition, feature extraction, position distance, training systems.

S. A. Kruglik, E. S. Ponomarev, D. I. Vetsler

Practical realization of ≪man-in-the-middle≫ attack on interfaced Bluetooth devices on an example of a wireless keyboard

The attack ≪man-in-the-middle≫ on the conjugated Bluetooth keyboard and computer is presented in this article. The most technologically difficult part of this attack with packet analysis and capture transmitted from computer to keyboard is first made on affordable equipment.

Key words: Bluetooth, information security, security in wireless networks

D. V. Oryol, A. P. Zhuk

Method for improving navigation signal noise immunity of the satellite navigation system

This article presents a method for improving the navigation signal noise immunity for the satellite navigation system. It is performed by improving its structural secrecy, which is implemented using an increased number of stochastic quasiorthogonal sequence sets. Sequence sets are formed by functional transformation of pseudorandom arguments.

Key words: noise immunity, structural secrecy, satellite radio navigation, sequence set.

I. Y. Sysoev, E. M. Gabidulin

Rank codes using a weak self-orthogonal basis

Syndrome computation is the significant part of a rank decoding procedure. Using a weak self-orthogonal basis, one can decrease its complexity. In this case, the major part of complexity evaluation is approximated by $n(\log n)^2$. It is less than the complexity when using Karatsuba's algorithm only.

Key words: error detection and correction, rank codes, weak self-orthogonal basis, fast computing, Karatsuba's algorithm, FPGA, implementation, optimization.

K. E. Shilov

Development of the multirotor unmanned aerial vehicle flight control system

Recently, Unmanned Aerial Vehicles (UAVs) being a rapidly developing field attract more and more attention of scientists and costumers. Particular attention is given to Multirotor UAVs, which are known to be good flying platforms for high-quality aerial photography, videography, monitoring and other terrain explorations due to their ability of low-speed flight, hovering and vertical take off and landing. Described characteristics make them easy to use in space limited conditions. Obviously, the behavior of such vehicles is unstable, therefore, Flight Control System (FCS) responsible for both stabilization and navigation functions is required. Additionally, FCS is able to provide the capability of fully autonomous flight. Rapid development of contemporary electronics makes it possible to create low-cost and compact FCS.

Key words: flight control system, unmanned aerial vehicle, inertial navigation system, satellite navigation system, autonomous flight, complementary filtering, Kalman filtering, PID-regulator, ground control station.

B. I. Basok, V. V. Gotsulenko

Negative thermal resistance in the one-dimensional steady flow of a perfectly inviscid gas

The analytical expression for the thermal resistance that occurs when a polytropic heat is supplied to the moving inviscid gas is found. The resulting expression allows the change in internal gas energy and, under certain conditions, the zone has a ≪negative≫ resistance region. This leads to a loss of stability of the steady gas flow and self-excitation of thermoacoustic oscillations.

Key words: ≪negative≫ resistance region, thermoacoustic self - oscillations, threshold condition, ideal gas.

A. Yu. Vishnyakov, Yu. N. Deryugin, V. A. Glazunov, I. N. Chistyakova

Software package LOGOS. Module for calculation of conjugate and coupled heat conductivity tasks

The description of a computational technique is presented for calculation of heat conductivity problems in solid-state designs created within the scope of software package LOGOS [1]. Computational techniques are based on the finite volume method and the implicit approximation of a heat flux through cells sides. Two methods for calculation of a heat flux are described. These are the suspended correction technique [2] and the gradient technique [3]. Computational algorithms are given in terms of a temperature increment (delta form of difference equations) [4]. These algorithms are oriented to solving transient and steady-state heat problems on unstructured grids for both isotropic and anisotropic heat conductivity. The right part of the equation is calculated explicitly from the previous iteration orfrom the bottom layer. In terms of a temperature increment the right part is the residual of balance equations (error approximation). The final system of difference equations is calculated by solvers from the PMLP library [5].

Key words: isotropic and anisotropic heat conductivity, finite volume method, delta form of difference equations, unstructured mesh, approximation, simulation.

T. V. Vuong, A. S. Bukin, Yu. I. Khlopkov

Method for description of turbulent flows

Generalization of kinetic ideas is discussed to describe a continuous system. An attempt is distribution function of pulsations. In particular, a sample of turbulent spot dissipation the rarefied gas field is used to solve the problem.

Key words: Monte-Carlo: direct simulation, dissipation of turbulent spots, interference of turbulent spots.

G. A. Krasnova

Intergovernmental initiatives in the field of professional education and training: status and prospects

The article is devoted to interstate cooperation in vocational education and training in Europe, Asia Pacific and BRICS, which is a consequence of the processes of regionalization of the world economy, which has a significant impact on the world and regional labor market.

Key words: lifelong learning, Cooperative and Work-Integrated Education, nonformal and informal learning.

G. V. Mozhaeva, P. N. Mozhaeva Renha

Swedish model of vocational education and training and its implementation in Russia

The article presents the results of analysis of the features of the Swedish model of vocational education and training (VET), its main characteristics and the principles on which it is based. The features of the Swedish model are highlighted, including the establishment of a mechanism of interaction between the state, business and education, job training, the employer's participation in the program, the constant monitoring of the quality of teaching.

On an example of retraining programs «Electronic Business», the potential of the Swedish model of VET in the Russian education system is considered. The features of the joint Russian-Swedish program of professional retraining as an example of the successful solution of tasks of continuous education development are considered.

Key words: vocational education and training, Swedish model of VET, integrated education, professional retraining, e-business.