

ВЕСТНИК



**ЮЖНО-УРАЛЬСКОГО
ГОСУДАРСТВЕННОГО
УНИВЕРСИТЕТА**

**2021
Т. 14, № 3**

ISSN 2071-0216 (Print)
ISSN 2308-0256 (Online)

СЕРИЯ

«МАТЕМАТИЧЕСКОЕ МОДЕЛИРОВАНИЕ И ПРОГРАММИРОВАНИЕ»

Решением ВАК России включен в Перечень рецензируемых научных изданий

**Учредитель – Федеральное государственное автономное образовательное
учреждение высшего образования
«Южно-Уральский государственный университет
(национальный исследовательский университет)»**

Основной целью издания является пропаганда союза качественных и численных исследований математических моделей. Предпочтение при публикации будут иметь статьи, посвященные результатам качественных исследований математических моделей, выявляющих какие-либо неочевидные их свойства; результатам численных исследований, содержащих разработки новых вычислительных алгоритмов применительно к математическим моделям; и комплексам программ, созданным для постановки вычислительных экспериментов.

Редакционная коллегия

к.ф.-м.н., доц. **Бычков Е.В.**,
к.ф.-м.н., проф. **Заляпин В.И.**,
д.ф.-м.н., проф. **Замышляева А.А.**,
д.ф.-м.н., доц. **Келлер А.В.**,
д.ф.-м.н., доц. **Манакова Н.А.**
(*отв. секретарь*),
д.ф.-м.н., проф. **Свиридюк Г.А.**
(*гл. редактор*)

Редакционный совет

проф., д-р **Аббас С.**,
д.ф.-м.н., проф. **Банасяк Я.**,
д.т.н., проф. **Богомоллов А.В.**,
д.ф.-м.н. **Бржезинская М.М.**,
д.т.н., проф. **Володарский Е.Т.**,
проф., д-р **Вонг П.**,
д.ф.-м.н., проф. **Зелик С.В.**,
проф., д-р **Йонг Ли**,

д.ф.-м.н., проф. **Кадченко С.И.**,
д.ф.-м.н., акад. НАН Республики
Казахстан **Кальменов Т.Ш.**,
д.ф.-м.н., доц. **Корпусов М.О.**,
д.т.н., чл.-кор. РАН **Новиков Д.А.**
(*председатель*),
д.т.н., г.н.с. **Поляк Б.Т.**,
д.ф.-м.н., проф. **Пятков С.Г.**,
проф., д-р **Ривера Ж.Е.М.**,
проф., д-р **Та Зуй Фыонг**,
проф., д-р **Тиба Д.**,
д.т.н., проф. **Уткин Л.В.**,
проф., д-р **Фавини А.**,
д.ф.-м.н., проф. **Фурсиков А.В.**,
д.ф.-м.н., чл.-кор. РАН **Ченцов А.Г.**



BULLETIN

OF THE SOUTH URAL
STATE UNIVERSITY

2021
Vol. 14, no. 3

SERIES

“MATHEMATICAL MODELLING,
PROGRAMMING & COMPUTER
SOFTWARE”

ISSN 2071-0216 (Print)
ISSN 2308-0256 (Online)

Vestnik Yuzhno-Ural'skogo Gosudarstvennogo Universiteta.
Seriya “Matematicheskoe Modelirovanie i Programirovanie”

South Ural State University

Main purpose of the publication is to promote the union of the qualitative of numerical studies of mathematical models. Articles, devoted to the results of qualitative studies of mathematical models, that identify any non-obvious properties, the results of numerical studies that contain the development of new computational algorithms applied for the computational experiments, will have the preference for publication.

Editorial Board

E.V. Bychkov, South Ural State University, Chelyabinsk, Russian Federation
A.V. Keller, Voronezh State Technical University, Voronezh, Russian Federation
N.A. Manakova, South Ural State University, Chelyabinsk, Russian Federation
G.A. Sviridyuk, South Ural State University, Chelyabinsk, Russian Federation
V.I. Zalyapin, South Ural State University, Chelyabinsk, Russian Federation
A.A. Zamyshlyayeva, South Ural State University, Chelyabinsk, Russian Federation

Editorial Council

S. Abbas, Indian Institute of Technology Mandi, Mandi, India
J. Banasiak, University of Pretoria, Pretoria, Republic of South Africa
A.V. Bogomolov, Burnasyan Federal Medical Biophysical Center of Federal Medical Biological Agency, Moscow, Russian Federation
M.M. Brzhezinskaya, Helmholtz-Zentrum Berlin for Materials and Energy, Berlin, Germany
A.G. Chentsov, Krasovskii Institute of Mathematics and Mechanics, Ural Branch of the RAS, Yekaterinburg, Russian Federation
A.V. Fursikov, Lomonosov Moscow State University, Moscow, Russian Federation
A. Favini, University of Bologna, Bologna, Italy
S.I. Kadchenko, Nosov Magnitogorsk State Technical University, Magnitogorsk, Russian Federation
T.Sh. Kal'menov, Institute of Mathematics and Mathematical Modelling, Almaty, Kazakhstan
M.O. Korpusov, Lomonosov Moscow State University, Moscow, Russian Federation
D.A. Novikov, V.A. Trapeznikov Institute of Control Sciences of the RAS, Moscow, Russian Federation
B.T. Polyak, V.A. Trapeznikov Institute of Control Sciences of the RAS, Moscow, Russian Federation
S.G. Pyatkov, Sobolev Institute of Mathematics, Siberian Branch of the RAS, Novosibirsk, Russian Federation
J.E.M. Rivera, Federal University of Rio de Janeiro, Institute of Mathematic, Rio de Janeiro, Brazil
Ta Duy Phuong, Hanoi Institute of Mathematics, Hanoi, Vietnam
D. Tiba, Institute of Mathematics Romanian Academy, Bucharest, Romania
E.T. Volodarskiy, National Technical University, Kiev, Ukraine
L.V. Utkin, Peter the Great Saint-Petersburg Polytechnic University, Saint Petersburg, Russian Federation
P.J.Y. Wong, Nanyang Technological University, School of Electrical and Electronic Engineering, Singapore, Singapore
Yong Li, College of Electrical and Information Engineering, Hunan University, Changsha, China
S.V. Zelik, University of Surrey, Guildford, United Kingdom

Содержание

Математическое моделирование

TWO-STAGE STOCHASTIC FACILITY LOCATION MODEL WITH QUANTILE CRITERION AND CHOOSING RELIABILITY LEVEL S.V. Ivanov, V.N. Akmaeva	5
---	---

О КРИПТОАНАЛИЗЕ СИСТЕМЫ ВВРС НА ДВОИЧНЫХ КОДАХ РИДА – МАЛЛЕРА Ю.В. Косолапов, А.А. Лелюк	18
--	----

APPLICATION OF THE SMOOTH APPROXIMATION OF THE PROBABILITY FUNCTION IN SOME APPLIED STOCHASTIC PROGRAMMING PROBLEMS V.R. Sobol, R.O. Torishnyy, A.M. Pokhvalenskaya	33
---	----

Программирование

INTELLECTUAL MATHEMATICAL SUPPORT SOFTWARE AND INNER ARCHITECTURE OF LMS MAI CLASS.NET E.A. Zharkov, V.D. Malygin	46
---	----

ON THE SCHEDULING PROBLEM OF CARGO TRANSPORTATION ON A RAILWAY NETWORK SEGMENT AND ALGORITHMS FOR ITS SOLUTION A.N. Ignatov	61
---	----

APPLICATION OF THE FINITE VOLUME METHOD FOR CALCULATING RADIATION HEAT TRANSFER IN APPLIED PROBLEMS K.Yu. Litvintsev, A.V. Sentyabov	77
--	----

Краткие сообщения

MATHEMATICAL MODELLING OF SPREAD COVID-19 EPIDEMIC FOR PREVENTIVE MEASURES TO PROTECT LIFE AND HEALTH OF ELDERLY Yu.A. Bubeev, B.M. Vladimirskiy, I.B. Ushakov, V.M. Usov, A.V. Bogomolov	92
---	----

CHOOSING AVERAGE VALUES WHEN DETERMINING CHARACTERISTICS OF THE UNSTEADY BOILING OF LIQUID A.A. Levin	99
---	----

РЕШАТЕЛИ СЛАУ С БЛОЧНО-ЛЕНТОЧНЫМИ МАТРИЦАМИ Б.Я. Штейнберг, А.А. Василенко, В.В. Веселовский, Н.А. Живых	106
---	-----

КОМБИНАТОРНЫЙ АНАЛИЗ СХЕМЫ ДВОЙНОЙ ПЕРЕСТАНОВКИ С ПОВТОРЕНИЕМ Н.Ю. Энатская	113
---	-----

Персоналии

ANDREI IVANOVICH KIBZUN (TO ANNIVERSARY SINCE BIRTH) A.V. Naumov	121
---	-----

Contents

Mathematical Modelling

TWO-STAGE STOCHASTIC FACILITY LOCATION MODEL WITH QUANTILE CRITERION AND CHOOSING RELIABILITY LEVEL S.V. Ivanov, V.N. Akmaeva	5
CRYPTANALYSIS OF THE BBCRS SYSTEM ON REED–MULLER BINARY CODES Yu.V. Kosolapov, A.A. Lelyuk	18
APPLICATION OF THE SMOOTH APPROXIMATION OF THE PROBABILITY FUNCTION IN SOME APPLIED STOCHASTIC PROGRAMMING PROBLEMS V.R. Sobol, R.O. Torishnyy, A.M. Pokhvalenskaya	33

Programming and Computer Software

INTELLECTUAL MATHEMATICAL SUPPORT SOFTWARE AND INNER ARCHITECTURE OF LMS MAI CLASS.NET E.A. Zharkov, V.D. Malygin	46
ON THE SCHEDULING PROBLEM OF CARGO TRANSPORTATION ON A RAILWAY NETWORK SEGMENT AND ALGORITHMS FOR ITS SOLUTION A.N. Ignatov	61
APPLICATION OF THE FINITE VOLUME METHOD FOR CALCULATING RADIATION HEAT TRANSFER IN APPLIED PROBLEMS K.Yu. Litvintsev, A.V. Sentyabov	77

Short Notes

MATHEMATICAL MODELLING OF SPREAD COVID-19 EPIDEMIC FOR PREVENTIVE MEASURES TO PROTECT LIFE AND HEALTH OF ELDERLY Yu.A. Bubeev, B.M. Vladimirskiy, I.B. Ushakov, V.M. Usov, A.V. Bogomolov	92
CHOOSING AVERAGE VALUES WHEN DETERMINING CHARACTERISTICS OF THE UNSTEADY BOILING OF LIQUID A.A. Levin	99
SOLVERS FOR SYSTEMS OF LINEAR ALGEBRAIC EQUATIONS WITH BLOCK-BAND MATRICES B.Ya. Steinberg, A.A. Vasilenko, V.V. Veselovskiy, N.A. Zhivykh	106
COMBINATORIAL ANALYSIS OF THE SCHEME OF DUAL REPEATED TRANSFERS N.Yu. Enatskaya	113

Personalia

ANDREI IVANOVICH KIBZUN (TO ANNIVERSARY SINCE BIRTH) A.V. Naumov	121
---	-----