大连海事大学 DALIAN MARITIME UNIVERSITY
上海海关学院 SHANGHAI CUSTOMS COLLEGE
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辽宁数学 LIAONING MATH
大连市数学学会

2024 International Conference on Computational Modeling and Applied Mathematics - Chinese-Russian Conference "Differential Equations and Applications"

CONFERENCE BROCHURE

Dalian, China | August 2-4, 2024

Conference Guidelines

Respected leaders, experts, scholars and students:

Welcome to the beautiful Dalian, China to participate in the 2024 International Conference on Computational Modeling and Applied Mathematics - Chinese-Russian Conference "Differential Equations and Applications " hosted by the Dalian Maritime University!

In order to better grasp the information of the conference, please read the conference brochure carefully.

Notice

①The badge received at the time of registration is the credentials of the delegates to the meeting. Please wear and keep it properly during the meeting.

② The proportion of slide playback is recommended to be 16:9. Scholars who participated in the main session speech should submit the slide to the corresponding person in charge before the start of the session, and check whether it can be played normally. To protect the intellectual property rights, the conference does not provide slide replication. If necessary, please contact the speaker directly.

③During the conference, please set your phone to mute or vibration mode. If you have questions or need help, you can always ask the staff of the conference for help. We wish you a happy time at the conference and have a wonderful trip in Dalian, China.

Conference Guidelines

Conference Venue

Venue: Central Plaza Hotel Dalian

Address: No.145 ZhongshanRoad. Xigang District, Dalian, China

Main Session: 4F-Royal Palace

Applied Mathematics Session: 4F-Royal Palace (August 3), 7F-B Room (August 4)

Computational Modeling Session: 27F-Meeting Room

Registration

August 2 13:00-18:00 | Lobby of Central Plaza Hotel Dalian

August 3 08:00-08:30 | Lobby of Central Plaza Hotel Dalian

Contact us

Conference Secretary-Jean Wu 18122455684

Hotel Manager-Tang 13591321309

Transportation

Distance from Dalian International Airport | 12KM, about 30 mins by car

Distance from Dalian Railway Station | 2KM, about 5 mins by car

Distance from Dalian Maritime University | 10KM, about 25 mins by car

*For Non-Chinese Attendees, "Bring me to the hotel" card is available. You can show it to the taxi drivers and they will take you to the hotel.

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About CMAM&DEA 2024

Introduction

2024 International Conference on Computational Modeling and Applied Mathematics - Chinese-Russian Conference "Differential Equations and Applications" (CMAM 2024 & DEA) is hosted by Dalian Maritime University. The conference will be held on August 2-4, 2024 in Dalian, China.

2024 International Conference on Computational Modeling and Applied Mathematics (CMAM 2024) is a continuation of the Russian-Chinese Conference "Differential and Difference Equations" held in Novosibirsk in November 2023, and will be centered on the latest research areas of "Applied Mathematics", "Computational Mathematics" and "Computer Applications ". "The conference will provide an international platform for experts, professors, scholars, engineers, etc. from higher educational institutions, scientific research institutes, enterprises and institutions of domestic and foreign countries to share their scientific experience, expand their professional networks, exchange new ideas and present their research results face-to-face. It provides an international platform for experts, professors, scholars and engineers from domestic and foreign universities and institutes to share their research experiences, expand their professional networks, exchange new ideas face-to-face, and present their research results, to discuss the key challenges and research directions of the development of this field, and to promote scientific and technological innovation. At the same time, it builds a diversified international platform for academic exchanges and industry-university-research cooperation for teachers and students of the university, enhances the academic influence of Dalian Maritime University in this field, cultivates the top scientific research talents, and promotes the high-quality development of the discipline.

*The Conference is supported by the the National Natural Science Foundation of China (No.12371399 and No. 12271340), China Postdoctoral Science Foundation (No. 2023M740468) and the Liaoning Revitalization Talents Program (No. XLYC2203149). The Conference is supported by the Mathematical Center in Akademgorodok under the agreement (No. 075-15-2022-282) with the Ministry of Science and Higher Education of the Russian Federation.

Organization

Host

Dalian Maritime University

Introduction

Dalian Maritime University is a national key university directly under the Ministry of Transport and is one of the first universities to be included in the national "211 Project" and "Double First Class" construction. Dalian Maritime University is a university jointly established by the Ministry of Transport, the Ministry of Education, the People's Government of Liaoning Province, and the People's Government of Dalian City. Dalian Maritime University is known as the "cradle of navigators".

Organizer

School of Science, Dalian Maritime University

Co-organizers

Shanghai Customs College

Mathematical Center in Akademgorodok

Liaoning Mathematical Society

Dalian Mathematical Society

Committee

Conference Chairs

Prof. Cong Yuhao, Shanghai Customs College / Shanghai University

Prof. Gennadii V. Demidenko, Novosibirsk State University / Sobolev Institute of Mathematics

Technical Program Committee Chairs

Prof. Hu Guangda, Shanghai Customs College / Shanghai University

Prof. Alla A. Shcheglova, Matrosov Institute for System Dynamics and Control Theory of Siberian Branch of Russian Academy of Sciences

Technical Program Committee Members

Prof. Zhang Lei, Zhejiang University of Technology

Prof. Vladimir L. Vaskevich, Novosibirsk State University / Sobolev Institute of Mathematics

Prof. Inessa I. Matveeva, Novosibirsk State University / Sobolev Institute of Mathematics

Prof. Viktor F. Kravchenko, Kotelnikov Institute of Radioengineering and Electronics (IRE) of Russian Academy of Sciences

Prof. Zhu Peicheng, Shanghai University

Prof. Shao Lizhen, University of Science and Technology Beijing

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Prof. Fu Hongsun, Dalian Maritime University

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Gong Yi, Shanghai Customs College

Wang Zheng, Shanghai Customs College

O.V. Kravchenko, Federal Research Center Computer Science and Control (FRC CSC), Russian Academy of Sciences (RAS)

Publication Chairs

Prof. Zhang Huisheng, Dalian Maritime University

Prof. Qu Kai, Dalian Maritime University

Agenda

August 2 (Friday)	
13:00-18:00	**Registration**
August 3 (Saturday)	
08:00-08:30	**Registration**
Main Session: 4F-Royal Palace Session Chair: Sun Yidong, Hu Guangda	
08:30-09:10	**Opening Ceremony**
09:10-09:45	**Prof. Li Jichun, Department of Mathematical Sciences, University of Nevada Las Vegas, USA** Speech Title: Analysis and simulations of Maxwell's equations for invisibility cloaks and graphene
09:45-10:20	**Prof. Liu Zhenxin, Dalian University of Technology, China** Speech Title: The locally homeomorphic property and the multiplicative ergodic theorem for McKean-Vlasov SDEs
10:20-10:40	**Coffee Break**
10:40-11:15	**Prof. Gennadii V. Demidenko, Novosibirsk State University / Sobolev Institute of Mathematics, Russia** Speech Title: Partial differential equations not solvable with respect to the highest-order derivative
11:15-11:50	**Prof. Alla A. Shcheglova, Matrosov Institute for System Dynamics and Control Theory (IDSTU), Irkutsk, Russia** Speech Title: Stability of differential-algebraic equations
11:50-13:30	**Lunch**

Agenda

August 3 (Saturday) Applied Mathematics Session: 4F-Royal Palace Session Chair: Zhu Peicheng	
13:30-14:00	**Prof. Inessa I. Matveeva, Novosibirsk State University / Sobolev Institute of Mathematics, Russia** Speech Title: Asymptotic properties of solutions to nonautonomous time-delay systems
14:00-14:30	**Prof. Liu Liwei, Dalian Jiaotong University, China** Speech Title: Predicting circRNA-RBP Interaction Sites Using a Sequence and Structural Feature-Based Attention Model
14:30-15:00	**Prof. Vladimir L. Vaskevich, Sobolev Institute of Mathematics, / Novosibirsk State University, Novosibirsk, Russia** Speech Title: Problems for Differential and Integro-Differential Equations with Quadratic Nonlinearity
15:00-15:20	**Coffee Break**
Oral Presentation of Applied Mathematics Session: 4F-Royal Palace Session Chair: Li Wennan, Dong Wenqiang	
15:20-15:35	**Zhang Siqi, Dalian Maritime University** Speech Title: A proximal bundle algorithm for solving generalized variational inequalities with inexact datal
15:35-15:50	**Wang Tongtong, Dalian Maritime University** Speech Title: An mhADMM-PDAS method for elliptic optimal control problems with -control cost and box constraints on the control
15:50-16:05	**Viktor A. Denisiuk, Novosibirsk State University** Speech Title: Asymptotic properties of solutions to a system of nonlinear ordinary differential equations of large dimension

Agenda

Oral Presentation of Applied Mathematics Session: 4F-Royal Palace Session Chair: Li Wennan, Dong Wenqiang	
16:05-16:20	**Lai Jinyu, Northwest Minzu University** Speech Title: Interval vertex coloring of cartesian products and strong products of paths
16:20-16:35	**Valentina V. Shemetova, Novosibirsk State University** Speech Title: On solvability conditions for boundary value problems for the Vlasov-Rayleigh-Bishop equation
16:35-16:50	**Song Qixuan, Northwestern Polytechnical University** Speech Title: The lowest-order stabilized virtual element method for the Stokes problem
16:50-17:05	**Bao Kunlong, Shanghai University** Speech Title: A numerical method for the optimal boundary control of a Rayleigh-Bishop beam
17:05-17:20	**Chen Jiang, Shanghai University** Speech Title: Backstepping boundary control for the Rayleigh-Bishop beam
17:20-17:35	**Ma Xin，Novosibirsk State University** Speech Title: On the solvability of the first boundary value problem for one pseudohyperbolic equation of the sixth order
17:35-17:50	**Xin Liyue，Novosibirsk State University** Speech Title: Estimates for solutions to one class of functional difference equations
18:00-19:30	**Banquet**

Agenda

August 3 (Saturday) Computational Modeling Session: 27F-Meeting Room Session Chair: Zhang Huisheng	
13:30-14:00	**Dr. Sci. Michael V. Vesnik, Kotelnikov Institute of Radio Engineering and Electronics of the Russian Academy of Sciences(IRE RAS), Moscow,** **Russia** Speech Title: Examples of solving electromagnetic diffraction problems employing the heuristic method of fundamental components
14:00-14:30	**Prof. Zhang Lei, Zhejiang University of Technology, China** Speech Title: Wave scattering and inverse scattering in a multilayered medium
14:30-15:00	**Prof. Shao Lizhen, University of Science and Technology Beijing, China** Speech Title: Multi-objective Optimization and its Applications
15:00-15:20	**Coffee Break**
Oral Presentation of Computational Modeling Session: 27F-Meeting Room Session Chair: Wang Zheng, Sun Yan	
15:20-15:35	**Dong Sizhou, DFH Satellite Co., Ltd.** Speech Title: Research on Satellite Unidirectional Random Vibration Test Method Based on Vibration Fatigue Equivalence
15:35-15:50	**Liao Yilong, Shanghai University** Speech Title: Distributed feedback design in heating process control
15:50-16:05	**Lv Longjie, Dalian Maritime University** Speech Title: Numerical study on the effect of viscous dissipation on natural convection in a tilted square cavity filled with nanofluids

Agenda

Oral Presentation of Computational Modeling Session: 27F-Meeting Room Session Chair: Wang Zheng, Sun Yan	
16:05-16:20	**Wei Mingyue, Dalian Maritime University** Speech Title: Numerical Simulation of Heat Transfer in Multilayer Cookware
16:20-16:35	**Zhuang Kefeng, Dalian Maritime University** Speech Title: Heatline visualization of natural convection in an isosceles trapezoidal porous cavity filled with non-Newtonian nanofluids
16:35-16:50	**Chen Zhangxing, China Productivity Center for Machinery Co., Ltd., China Academy of Machinery Science & Technology Group Co., Ltd.** Speech Title: A method for calculating the allowable crack size of the main pipeline for a certain PWR
16:50-17:05	**Mu Yuanhai, Novosibirsk State University** Speech Title: Estimates for solutions in one predator-prey model with delay
17:05-17:20	**Wang Siying，Communication University of China** Speech Title：A study on players' momentum based on strategy and psychology: a perspective from physics
17:20-17:35	**Zhao Ningning，Beijing University Of Technology** Speech Title：Fixed-time Synchronization of Delayed MAM Neural Networks with Impulsive Disturbance
17:35-17:50	**Zhang Shuzhen，Beijing University Of Technology** Speech Title：The initial value problem for the equations of motion of fractional compressible viscous fluids
18:00-19:30	**Banquet**

Agenda

August 4 (Sunday) Applied Mathematics Session: 7F-B Room Session Chair: Inessa I. Matveeva, Huang Ming	
08:30-09:00	**Prof. Oleg V. Anashkin, Crimean Federal University, Simferopol, Russia** Speech Title: Stability in the critical case and bifurcations in periodic and almost periodic impulsive systems
09:00-09:30	**PhD. Mariia A.Skortsova, Novosibirsk State University, Novosibirsk, Russia** Speech Title: Estimates for solutions in Hopfield neural networks model
09:30-10:00	**PhD. Wang Zheng, Shanghai Customs College, China** Speech Title: Robust stability of second-order time-delay systems with unknown parameters
10:00-10:20	**Coffee Break**
10:20-10:50	**PhD. Timur K. Iskakov, Novosibirsk State University, Novosibirsk, Russia** Speech Title: Stability of the zero solution to a system of differential equations of neutral type with infinite distributed delay
10:50-11:20	**PhD. Dong Wenqiang, Shanghai Customs College, China / Sobolev Institute of Mathematics, Russia** Speech Title: Reduced-order design for discrete-time generalized quasi-one-sided Lipschitz nonlinear systems with multiple delays
11:30-14:00	**Lunch**
14:00-18:00	**Return Trip**
End of the conference	

Agenda

August 4 (Sunday) Computational Modeling Session: 27F-Meeting Room Session Chair: Zhang Lei, Wu Suqing	
08:30-09:00	**Prof. Zhao Zhengang, Shanghai Customs College, China** Speech Title: Theory analysis and finite element approximation for space Hadamard fractional differential equation
09:00-09:30	**Prof. Olga A. Azarova, Federal Research Center "Computer Science and Control" of the Russian Academy of Sciences (FRS CSC RAS), Moscow, Russia** Speech Title: Plasmagasdynamic control of high-speed flows
09:30-10:00	**Prof. Zhu Peicheng, Shanghai University, China** Speech Title: Two phase-field models for solid-solid phase transitions driven by configurational forces
10:00-10:20	**Coffee Break**
10:20-10:50	**Assoc. Prof. Wang Jue, Hangzhou Normal University, China** Speech Title: Nonradiating sources and their applications
10:50-11:20	**Researcher, Oleg V. Kravchenko, Federal Research Center "Computer Science and Control" of the Russian Academy of Sciences (FRS CSC RAS), Moscow, Russia** Speech Title: Effect of thermally stratified energy release on the parameters of high-speed flows and noise generation
11:30-14:00	**Lunch**
14:00-18:00	**Return Trip**
End of the conference	

Detail Information of Agenda

Plenary Speaker

Prof. Li Jichun
Department of Mathematical Sciences, University of Nevada Las Vegas, USA

Biography: Jichun Li is Professor of Mathematics and Director for Center for Applied Mathematics and Statistics at University of Nevada Las Vegas (UNLV). He got his BS from Nanjing University and PhD from Florida State University. His previous positions include Postdoc Fellow at University of Texas at Austin and Associate Director of Institute for Pure and Applied Mathematics (IPAM) at UCLA. He has published over 140 SCI journal papers and 2 monographs. Currently, he serves as Editor-in-Chief of "Results in Applied Mathematics", and Managing Editor of "Computers & Mathematics with Applications" (both published by Elsevier).

Speech Title: Analysis and simulations of Maxwell's equations for invisibility cloaks and graphene

Abstract: Maxwell's equations play an important role in analyzing and modeling of wave propagation in electric and optical materials. In this talk, I'll focus on some new variations of time-dependent Maxwell's equations resulting from complex electromagnetic materials such as metamaterials and graphene. Mathematical analysis and numerical simulations of these models (such as invisibility cloaks with metamaterials) will be discussed. Some open issues will be mentioned.

Plenary Speaker

Prof. Liu Zhenxin
Dalian University of Technology, China

Biography: Liu Zhenxin, professor at Dalian University of Technology. He is mainly engaged in the research of stochastic dynamic systems, and has made systematic and in-depth research on stochastic Conley indicator theory, recovery and stability in stochastic dynamic systems, and Kolmogorov stationary distribution limit problems. Currently he has published more than 40 academic papers. In 2010, he won the National 100 Outstanding Doctoral Thesis Nomination Award; in 2015, he received the National Science Fund for Outstanding Youth; in 2019, he received the National Science Fund for Outstanding Youth; in 2020, he was selected as one of Liaoning Province's "Hundreds and Thousands of Scientists" Talent Project" 100-level candidate; in 2022, he was selected as an outstanding expert in Dalian.

Speech Title: The locally homeomorphic property and the multiplicative ergodic theorem for McKean-Vlasov SDEs

Abstract: In this talk, we will explore two aspects that distinguish McKean-Vlasov SDEs significantly from classical SDEs. In the first part, we establish the locally diffeomorphic property of the solution to McKean-Vlasov SDEs defined in the Euclidean space. We observe that although the coefficients are global Lipschitz, the solution in general does not satisfy the globally homeomorphic property at any time except the initial time. In the second part, we introduce the concept of Lyapunov exponents for McKean-Vlasov SDEs. We observe that even when the coefficients are regular enough and the first-order derivatives are bounded, the limit in the definition of Lyapunov exponents may not exist. Furthermore, we establish the mean-field version of the multiplicative ergodic theorem. This talk is based on the collaboration with Xianjin Cheng and Lixin Zhang.

Plenary Speaker

Prof. Gennadii V. Demidenko
Novosibirsk State University / Sobolev Institute of Mathematics, Russia

Biography: Gennadii V. Demidenko, Doctor of Physical and Mathematical Sciences, professor, head of the Differential Equations Department of Novosibirsk State University; Principal Scientific Researcher, Head of the Laboratory of Differential and Difference Equations, Sobolev Institute of Mathematics of the Siberian Branch of the Russian Academy of Sciences (Novosibirsk). He is mainly engaged in research in the fields of partial differential equations, ordinary differential equations, difference equations, delay equations, mathematical analysis, and computational mathematics. He has hosted many projects of Russian Foundation for Basic Research. He has published 6 monographs and more than 120 high-level articles. He currently serves on the editorial board of several journals such as "Siberian Mathematical Journal", "Journal of Analysis and Applications", "International Journal of Dynamical Systems and Differential Equations", "Siberian Advances in Mathematics", and "Mathematics".

Speech Title: Partial differential equations not solvable with respect to the highest-order derivative

Abstract: We consider classes of differential equations not solvable with respect to the highest-order derivative. Solvability conditions of the Cauchy problem in a class of weighted Sobolev spaces are established. The uniqueness of the solution is proved and estimates are obtained.

The research is supported by the Russian Science Foundation (grant no. 24-21-00370), https://rscf.ru/project/24-21-00370/.

Plenary Speaker

Prof. Alla A. Shcheglova
Matrosov Institute for System Dynamics and Control Theory (IDSTU), Irkutsk, Russia

Biography: Alla Shcheglova – Doctor of Physical and Mathematical Sciences (2007), since 2012 she has been working as Deputy Director for Research at the Matrosov Institute for System Dynamics and Control Theory of the Siberian Branch of the Russian Academy of Sciences and Chief Researcher of the Department of Evolutionary Equations and Controlled Dynamical Systems. She is the author and co-author of more than a hundred scientific articles and one monograph. In 2020, she was awarded the title of "Honorary Worker of Science and High Technologies of the Russian Federation" by the Russia Ministry of Education and Science. Her main research interests are in the field of investigation of the solvability and qualitative properties of systems of differential equations that are not solved with respect to the higher derivatives and are identically degenerate in the domain of definition, including differential-algebraic equations, degenerate hybrid systems and descriptor systems with discrete time.

Speech Title: Stability of differential-algebraic equations

Abstract: Considering differential-algebraic equations, we construct the structural form and prove an existence theorem for solutions. The assumptions of the theorem guarantee that the first-approximation system has a left-invertible linear operator transforming the system to the structural form convenient for analysis. We obtain sufficient conditions for the stability of the nonlinear system by linear approximation under the assumptions that the corresponding part of the first-approximation system is reducible or proper. Also, we address the Lyapunov stability and robust stability of linear differential-algebraic equations.

Invited Speaker of Applied Mathematics Session

Prof. Inessa I. Matveeva
Novosibirsk State University / Sobolev Institute of Mathematics, Russia

Biography: Inessa I. Matveeva, Doctor of Physical and Mathematical Sciences (D.Sc.); Professor, Principal Scientific Researcher at Novosibirsk State University (Novosibirsk); Senior Scientific Researcher at the Sobolev Institute of Mathematics of the Siberian Branch of the Russian Academy of Sciences (Novosibirsk). She is the Head of the Group "Differential Equations and Dynamical Systems" at the Mathematical Center in Akademgorodok (Novosibirsk); Country Coordinator in the International Association "European Women in Mathematics", Country Ambassador of the Committee for Women in Mathematics of the International Mathematical Union. Her scientific interests include partial differential equations, ordinary differential equations, delay equations, difference equations, and computational linear algebra. She has published 3 monographs and more than 70 high-level articles.

Speech Title: Asymptotic properties of solutions to nonautonomous time-delay systems

Abstract: We consider classes of nonautonomous time-delay systems of differential equations. Using Lyapunov-Krasovskii functionals, we study asymptotic properties of solutions to these systems.

The research is supported by the Russian Science Foundation (grant no. 24-21-00367), https://rscf.ru/project/24-21-00367/.

Invited Speaker of Applied Mathematics Session

Prof. Liu Liwei

Dalian Jiaotong University, China

Biography: Liwei Liu, Professor, Doctor of Science, Master's Degree Supervisor. He is currently serving as Dean of the College of Science, Dalian Jiaotong University, Vice President of Dalian Mathematical Society, Expert of Assessment and Monitoring of Degree and Postgraduate Education of the Ministry of Education, and Expert of High-tech Enterprises Assessment in Dalian. He is mainly engaged in bioinformatics research, specifically in protein target prediction, circRNA-protein interaction prediction, etc. He has published more than 30 academic papers.

Speech Title: Predicting circRNA-RBP Interaction Sites Using a Sequence and Structural Feature-Based Attention Model

Abstract: The prediction of interaction sites between cir cular RNA (circRNA) and RNA binding proteins (RBPs) is crucial for regulating diseases and discovering new treatment approaches. Computational models have been widely used to predict circRNA-RBP interaction sites due to the availability of genome-wide circRNA binding event data. However, efficiently obtaining multi-scale circRNA features to improve prediction accuracy remains a challenging problem. In this study, we propose SSCRB, a lightweight model for predicting circRNA-RBP interaction sites. Our model extracts both sequence and structural features of circRNA and incorporates multi-scale features through the attention mechanism. Furthermore, we develop an ensemble model by combining multiple submodels to enhance predictive performance and generalizability. We evaluate SSCRB on 37 circRNA datasets and compare it with other state-of-the-art methods. The average AUC of SSCRB is 97.66%, demon strating its efficiency and robustness. SSCRB outperforms other methods in terms of prediction accuracy while requiring significantly fewer computational resources.

Invited Speaker of Applied Mathematics Session

Prof. Vladimir L. Vaskevich
Sobolev Institute of Mathematics / Novosibirsk State University, Novosibirsk, Russia

Biography: Vaskevich Vladimir is a doctor in Mathematical and Physical Sciences, a professor at Novosibirsk State University, and the Leading Scientific Researcher at the Sobolev Institute of Mathematics. He mainly engages in research on ordinary differential equations, partial differential equations, boundary value problems, integral differential equations, Sobolev spaces, mathematical and physical methods, numerical methods, and other aspects.

Speech Title: Problems for Differential and Integro-Differential Equations with Quadratic Nonlinearity

Abstract: A functional equation is considered in which a linear combination of a two-variable function and its time derivative is set equal to the double integral of a quadratic expression of the same function with respect to space variables. For the resulting integro-differential equation with quadratic nonlinearity, the Cauchy problem with initial data continuous and bounded on the positive semiaxis is investigated. The convergence of the classical method of successive approximations is proved. The accuracy of the approximation is estimated depending on the index of the iterative solution. It is proved that the problem has a solution in associated function spaces, and the uniqueness of this solution is established. An a priori estimate for solutions from the associated well-posedness class is derived. A guaranteed time interval of solution existence is found.

Invited Speaker of Applied Mathematics Session

Prof. Oleg V. Anashkin
Crimean Federal University, Simferopol, Russia

Biography: Anashkin, Oleg Vasilievich, DSc, PhD, Professor, Crimean Federal University, Simferopol, Russia

Speech Title: Stability in the critical case and bifurcations in periodic and almost periodic impulsive systems

Abstract: Many evolutionary processes in the real world are characterized by sudden changes at certain times. These changes are called to be impulsive phenomena, which are widespread in modeling in mechanics, electronics, biology, neural networks, medicine, and social sciences. Despite the large number of publications devoted to impulsive systems of the considered type, the qualitative theory, in particular, the theory of bifurcations is far from being sufficiently developed. The article considers some new methods of studying stability in the critical case and bifurcations of fixed points and almost periodic solutions.

Invited Speaker of Applied Mathematics Session

PhD. Mariia A.Skortsova

Novosibirsk State University, Novosibirsk, Russia

Biography: Skvortsova, Mariia Aleksandrovna is a PhD in Mathematical and Physical Sciences, a Senior Scientific Researcher and Assistant Professor at Novosibirsk State University, and a Senior Scientific Researcher at the Sobolev Institute of Mathematics.

Speech Title: Estimates for solutions in Hopfield neural networks model

Abstract: We consider Hopfield neural networks model described by a system of differential equations of neutral type with several delays. Using Lyapunov-Krasovskii functionals we obtain estimates for solutions characterizing the stabilization rate at infinity.

The research is supported by the Russian Science Foundation (grant no. 24-21-00367),https://rscf.ru/project/24-21-00367/.

Invited Speaker of Applied Mathematics Session

PhD. Wang Zheng
Shanghai Customs College, China

Biography: Zheng Wang, a teacher at Shanghai Customs College. He is mainly engaged in the stability analysis and model reduction of ordinary differential equations and delayed differential equations. He has participated in one project of National Natural Science Foundation and one project of Shanghai Natural Science Foundation. He has published many academic papers in core journals, and made three reports at international academic conferences and two reports at domestic academic conferences.

Speech Title: Robust stability of second-order time-delay systems with unknown parameters

Abstract: This report mainly discusses the stability of second-order time-delay systems. We consider the robust stability of second-order time-delay systems with unknown parameters. Based on the argument principle, we provide sufficient conditions for the robust stability of the delay systems. These sufficient conditions are easy to check. Numerical examples are given to illustrate the effectiveness of the main results.

Invited Speaker of Applied Mathematics Session

PhD. Timur K. Iskakov
Novosibirsk State University, Novosibirsk, Russia

Biography: Iskakov, Timur Kairatovich is a PhD in Mathematical and Physical Sciences, a Senior Scientific Researcher and Assistant Professor at the Novosibirsk State University, and the Scientific Researcher at the Sobolev Institute of Mathematics.

Speech Title: Stability of the zero solution to a system of differential equations of neutral type with infinite distributed delay

Abstract: We consider a system of linear nonautonomous differential equations of neutral type with infinite distributed delay. Sufficient conditions for asymptotic stability of the zero solution are established, estimates characterizing decay rates of solutions at infinity are obtained.

The research is supported by the Russian Science Foundation (grant no. 24-21-00367),https://rscf.ru/project/24-21-00367/.

Invited Speaker of Applied Mathematics Session

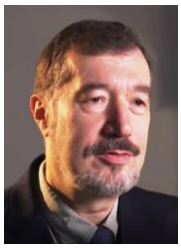
PhD. Dong Wenqiang
Shanghai Customs College, China;
Sobolev Institute of Mathematics, Russia

Biography: Wenqiang Dong, lecturer at Shanghai Customs College and researcher at Sobolev Insititute of Mathematics. Main research directions: Qualitative theory of differential equations, difference equations and delayed differential equations, linear control and nonlinear control. He is currently in charge of one project of the Shanghai Youth Science and Technology Talent Program, participating in three projects funded by the National Natural Science Foundation of China, and one project funded by Shanghai Science Foundation. He has published multiple high-level academic papers.

Speech Title: Reduced-order design for discrete-time generalized quasi-one-sided Lipschitz nonlinear systems with multiple delays

Abstract: In this talk, the generalized quasi-one sided Lipschitz condition and the generalized quadratic inner-boundness condition are introduced to investigate the problem of observer design for a class of discrete-time nonlinear systems with multiple delays. The sufficient condition for the asymptotic stability of full-order state observer for discrete-time nonlinear systems with multiple delays is proposed. Subsequently, the sufficient condition for the existence of reduced-order observer for systems is given. It should be noted that, under generalized quasi-one-sided Lipschitz condition, the full-order state observer and reduced-order state observer for discrete-time nonlinear systems with multiple delays can be designed even though the linear parameter (A,C) of systems is not detectable.

Invited Speaker of Computational Modeling Session



Dr. Sci. Michael V. Vesnik
Kotelnikov Institute of Radio Engineering and Electronics of the Russian Academy of Sciences(IRE RAS), Moscow, Russia

Biography: M.V. Vesnik is a Doctor of Sciences in Physics and Mathematics and holds the position of Leading Researcher at the Kotelnikov IRE RAS. Dr. Vesnik's area of scientific interests is heuristic methods in diffraction theory, including his proposed and developed method of fundamental components (MFC). A special feature of the MFC is the presence of an «adjustment» procedure. In contrast to traditional heuristic approaches such as GO, PO, GTD, PTD (MEW), MFC allows one to build heuristic solutions with increased accuracy brought to the specified values in the entire range of input parameters. Within the framework of this direction, Dr. M.V. Vesnik's theoretical research is carried out in the field of heuristic methods for solving a number of topical problems of diffraction and wave scattering at air, land and sea radar targets, radio wave propagation in urban areas, etc.

Speech Title: Examples of solving electromagnetic diffraction problems employing the heuristic method of fundamental components

Abstract: A description of a new method for obtaining heuristic analytical formulas of the diffraction theory - the method of fundamental components is given. The new method is compared with other methods for solving diffraction problems. The solutions obtained using the new method are listed. It is shown that the method of fundamental components provides new possibilities for solving topical practical resource-intensive problems of diffraction. The possibility of employing the new approach to create a highly efficient (fast and accurate) solver, as well as to carry out a physical interpretation of numerical solutions, is shown.

Invited Speaker of Computational Modeling Session

Prof. Zhang Lei

Zhejiang University of Technology, China

Biography: Lei Zhang, Doctor, currently professor of Mathematics Department of Zhejiang University of Technology, doctoral supervisor. His research interests are inverse problems in mathematical physics, and his current focus is on the mathematical theory and calculation methods of complex backscattering of rough (random) surfaces, and the application of machine learning to inverse problems. He graduated from the School of Mathematics, Jilin University, and then worked as a postdoctoral researcher in the Department of Mathematics, Zhejiang University. 2018-2019 Visiting Scholar at Purdue University in the United States. He won the "Outstanding Young Academic Award" of the 8th (2016) National Anti-Problem Annual Conference and the third (2020) Outstanding Young Academic Award of Heilongjiang Provincial Mathematical Society. He has presided over a number of scientific research projects, including 2 projects of the National Natural Science Foundation and key projects of Zhejiang Natural Science Foundation. He has published more than 30 academic papers in IP, JCP, SIIMS, JDE, CICP and other journals, and has been invited to give presentations at domestic and foreign academic conferences for many times.

Speech Title: Wave scattering and inverse scattering in a multilayered medium

Abstract: This talk concerns the mathematical analysis and numerical method for composite scattering and inverse scattering in a multilayered medium. The composite scattering problem from obstacles and the unbounded rough surface refers to the electromagnetic waves interacting with the interface of the medium and the obstacles in the medium. Such issues have critical applications in remote sensing, nondestructive testing, geophysics, national defence and military, and many other fields. We will discuss the time-harmonic and time-domain problems and introduce the recent progress.

Invited Speaker of Computational Modeling Session

Prof. Shao Lizhen

University of Science and Technology Beijing, China

Biography: Lizhen Shao, Professor at the School of Automation and Electrical Engineering, University of Science and Technology Beijing. She received her PhD in Engineering Science from the University of Auckland, New Zealand in 2008. She was a postdoctoral research fellow at the department of Engineering Science, University of Auckland from 2008 to 2009, and was a visiting scholar at Lancaster University in the UK from 2014 to 2015. Her main research interests include numerical optimization methods, multi-objective optimization and its application, machine learning. She has published 1 monograph and over 40 high-level articles.

Speech Title: Multi-objective Optimization and its Applications

Abstract: Many real-world search and optimization problems are naturally multi-objective. Due to the lack of suitable solution techniques, such problems were artificially converted into a single-objective problem and solved. The difficulty arose because such problems give rise to a set of trade-off optimal solutions, instead of a single optimum solution. It then becomes important to find not just one Pareto-optimal solution, but as many of them as possible. This is because any two such solutions constitute a trade-off among the objectives and users would be in a better position to make a choice when many such trade-off solutions are unveiled. In this talk, we will introduce some basic concepts, algorithms, and practical applications of multi-objective optimization.

Invited Speaker of Computational Modeling Session

Prof. Zhao Zhengang
Shanghai Customs College, China

Biography: Zhengang Zhao, Professor, Shanghai Customs College, PhD in Computational Mathematics from Shanghai University. Main research interests include numerical calculations of differential equations and research on customs big data. Personal research achievement "Numerical Methods for Fractional Order Differential Equations" won the third prize of the Shanghai Science and Technology Award for Natural Science (2017, second key contributor). He personally won the Special Contribution Award of the Customs Society of Shanghai Customs College from 2009 to 2014. He also led and finished a National Natural Science Foundation project of China, a general project of the Shanghai Natural Science Foundation and so on.

Speech Title: Theory analysis and finite element approximation for space Hadamard fractional differential equation

Abstract: The useful properties of fractional derivatives, such as non-locality and more degrees of freedom than classical integer order derivatives, have caused them to receive increasing attention. It is shown that the Hadamard fractional derivatives are more suitable for modeling very slow processes, such as the Lomnitz logarithmic creep law of igneous rock. Solving problems with Hadamard fractional derivatives is much more complicated, due to the logarithmic kernels of these derivatives. In this report, we will discuss the space Hadamard fractional partial differential equation.

Invited Speaker of Computational Modeling Session

Prof. Olga A. Azarova
Federal Research Center "Computer Science and Control" of the Russian Academy of Sciences (FRS CSC RAS), Moscow, Russia

Biography: Dr. Prof. Olga A. Azarova, PhD, DSci, AIAA Senior Member, Full Member of the Russian Academy of Natural Sciences, Leading Research Scientist, Department of Mathematical Modeling of Computer-Aided Design Systems, Federal Research Center "Computer Science and Control" of the Russian Academy of Sciences (FRS CSC RAS), Moscow, Russia. Olga Azarova graduated from the Lomonosov Moscow State University. Olga Azarova received her PhD and DSci degrees in Mechanics of Fluids, Gases and Plasma at Dorodnicyn Computing Centre of RAS. Field of her research interests: fluid mechanics, computational fluid dynamics, numerical simulation, aerodynamics, flow control, CFD coding, Richtmyer-Meshkov instability, vortex dynamics, compressible turbulence, shock waves. Olga Azarova collaborated with Rutgers University, NJ, USA. She participated in 68 international conferences; list of her publications includes more than 150 names.

Speech Title: Plasmagasdynamic control of high-speed flows

Abstract: The ideas of controlling supersonic flows by investing energy in front of the bow shock wave and at various points on the surface of a streamlined body were expressed in the second half of the last century, and currently research in this direction constitutes a vast area of aerospace engineering in the world. The report presents the recent results in active plasma high-speed flow control, including control of the bow shock wave and aerodynamic characteristics of the body with the use of near-surface energy deposition initiated by a gas discharge, as well as the main approaches to controlling high-speed flows and increasing flow stability using thermally stratified energy sources.

Invited Speaker of Computational Modeling Session

Prof. Zhu Peicheng
Shanghai University, China

Biography: Peicheng Zhu, male, was born in Yongkang City, Jinhua City, Zhejiang Province in July 1969. Fudan University, Kyushu University, Japan. Postdoctoral fellow, Beijing Institute of Applied Physics and Computational Mathematics, Japan Academic Promotion Association. He is currently a professor of Shanghai University, a doctoral supervisor, and a distinguished professor of Shanghai High-end Talent Program. He was the head of the mathematics department of the School of Science, Shanghai University. Scientific Chinese Person of the Year 2016. He has worked in Japan, Germany and Spain. His research areas are applied mathematics, modeling of materials science, fluid mechanics and their applications in industry. He has published more than 60 papers in international journals, two monographs, two doctoral theses and two post-doctoral research reports. More than 20 doctors and masters have been trained. He has successfully completed scientific research projects in many countries, including "Research on mathematical problems based on micro and nano fluid simulation in high pressure common rail Technology for automobiles", "development of some financial and insurance related software" and "Research on basic problems in High pressure common rail Technology".

Speech Title: Two phase-field models for solid-solid phase transitions driven by configurational forces

Abstract: This talk is based on the work by the speaker of this talk and his colleagues during last two decades or so. We first present two novel types of phase-field models, which were formulated in the beginning of this century, by H.-D. Alber (from Tech. Univ. Darmstadt, Germany) and the speaker, for solid-solid phase transformations driven by configurational forces in elastically deformable solids.

Invited Speaker of Computational Modeling Session

Assoc. Prof. Wang Jue
Hangzhou Normal University, China

Biography: Jue Wang, Associate Professor at Hangzhou Normal University. He mainly studies the mathematical theory of inverse problems in mathematical physics and the related numerical solutions of partial differential equations, with special attention to the inverse problems of electromagnetic nondestructive testing and the mathematical theories and numerical algorithms of acoustic and electromagnetic scattering and backscattering problems in complex backgrounds. He has published more than 20 scientific research papers and presided over several scientific research projects such as the National Natural Science Foundation and the Natural Science Foundation of Zhejiang Province.

Speech Title: Nonradiating sources and their applications

Abstract: This work offers an extensive exploration of nonradiating sources for the 2D and 3D-dimensional biharmonic wave equations. Various equivalent characterizations are derived to reveal the nature of a nonradiating source. Additionally, we establish the connection between nonradiating sources in the biharmonic wave equation and those in the Helmholtz equation as well as the modified Helmholtz equation. Several illustrative examples are explicitly constructed to showcase the existence of nonradiating sources.

Invited Speaker of Computational Modeling Session

Researcher, Oleg V. Kravchenko
Federal Research Center "Computer Science and Control" of the Russian Academy of Sciences (FRS CSC RAS), Moscow, Russia

Biography: -Kravchenko, Oleg V., Researcher, Federal Research Center "Computer Science and Control" of the Russian Academy of Sciences (FRS CSC RAS), Moscow, 119333, Russia

Speech Title: Effect of thermally stratified energy release on the parameters of high-speed flows and noise generation

Abstract: Flight control of supersonic civil aircraft is an important task of our time. Active control methods that provide a quick response to emerging changes in the flow structure are relevant. Active control methods also include local energy deposition methods. In this case, the energy source may be stratified in nature. Therefore, there are issues related to the interaction of the shock wave with the stratified energy source. Also important are the issues of controlling the lift and drag forces in the presence of a finite time thermally stratified energy source. One of the key problems is the problem of noise reduction in the design of supersonic aircraft, and its solution can have a significant impact on the speed of development of supersonic aviation in general. In this report the problems of high-speed flow control using thermally stratified energy deposition including the control of the noise impact on the ground are considered.

Oral Presentation of Applied Mathematics Session

➢ **Zhang Siqi, Dalian Maritime University**

Speech Title: A proximal bundle algorithm for solving generalized variational inequalities with inexact datal

Abstract: In this paper, a proximal bundle algorithm based on the proximal point method is proposed for solving generalized variational inequalities with inexact data. Firstly, the inexactness of the subgradient and function values are given. On this basis, a series of piecewise linear convex functions are constructed to approach the original function gradually from below, and finally the optimal solution is found. Then the basic steps of the algorithm are introduced and the specific descent test and optimality certificate. Finally, the convergence of the algorithm is verified in different specific cases, and the work of this paper is summarized, and a prospect for the future work is given.

➢ **Wang Tongtong, Dalian Maritime University**

Speech Title: An mhADMM-PDAS method for elliptic optimal control problems with -control cost and box constraints on the control

Abstract: In this paper, elliptic optimal control problems with -control cost and box constraints on the control are considered. Motivated by the efficient performance of the multilevel heterogeneous alternating direction method of multipliers (mhADMM) and the primal-dual active set (PDAS) method, we combine the strengths of both methods and propose a two-phase mhADMM-PDAS method. In Phase I, we employ the mhADMM algorithm, known for its efficiency in achieving moderate accuracy solutions. Subsequently, in Phase II, we utilize the PDAS method as a post-processor to refine the solutions obtained from Phase I to achieve higher accuracy. Moreover, numerical results demonstrate the efficiency of the proposed mhADMM-PDAS method.

Oral Presentation of Applied Mathematics Session

➢ **Viktor A. Denisiuk, Novosibirsk State University**

Speech Title: Asymptotic properties of solutions to a system of nonlinear ordinary differential equations of large dimension

Abstract: A system of nonlinear ordinary differential equations of large dimension is considered. We investigate asymptotic properties of solutions to the system in dependence on the growth of the number of the equations. We prove that, for sufficiently large number of differential equations, the last component of the solution to the Cauchy problem is an approximate solution to an initial value problem for one delay differential equation.

The work is supported by the Mathematical Center in Akademgorodok under agreement No. 075-15-2022-282 with the Ministry of Science and Higher Education of the Russian Federation.

➢ **Lai Jinyu, Northwest Minzu University**

Speech Title: Interval vertex coloring of cartesian products and strong products of paths

Abstract: In this paper, we study the closed interval vertex coloring problem of Cartesian product of paths and strong product graphs. One of the motivations for study this kind of vertex coloring is the following: let vertices of a graph represent agents and edges of a graph represent relationships between agents (two vertices are adjacent if the corresponding agents can meet and share their information). Each agent knows only his part of the special code (represented by its color). If an agent needs to know the whole "continuous" part of code, he has to get all parts of code from his informers. To ensure higher security, we require that the resulting code is as long as possible. The research method provides the lower bound of interval vertex coloring for the Cartesian product and strong product graph of the path by using the construction coloring method. The results show that for any integer m, $n \geq 2$ the chromatic number of the closed interval vertex coloring of the Cartesian product of paths and the strong product graph is at least $m+n-1$ and $2m+n-2$, respectively.

Oral Presentation of Applied Mathematics Session

➢ **V.V. Shemetova, Novosibirsk State University**

Speech Title: On solvability conditions for boundary value problems for the Vlasov-Rayleigh-Bishop equation

Abstract: In this paper we consider one class of equations not solvable with respect to the highest- order derivative. Initial-boundary value problems in the quarter plane are studied. A classification of boundary value problems is introduced. Conditions for the unique solvability in Sobolev spaces with an exponential weight are established.

The research is supported by the Russian Science Foundation (grant no. 24-21-00370), https://rscf.ru/project/24-21-00370/

➢ **Song Qixuan, Northwestern Polytechnical University**

Speech Title: The lowest-order stabilized virtual element method for the Stokes problem

Abstract: In this talk, we will introduce two stabilized mixed virtual element schemes for the Stokes problem based on the lowest-order velocity-pressure pairs (i.e., a piecewise constant approximation for pressure and an approximation with an accuracy order k=1 for velocity). By applying local pressure jump and projection stabilization, we ensure the well-posedness of our discrete schemes and obtain the corresponding optimal H^1- and L^2- error estimates. The proposed schemes offer a number of attractive computational properties, such as, the use of polygonal/polyhedron meshes (including non-convex and degenerate elements), yielding a symmetric linear system that involves neither the calculations of higher-order derivatives nor additional coupling terms, and being parameter-free in the local pressure projection stabilization. Finally, we present the matrix implementations of the essential ingredients of our stabilized virtual element methods and investigate two- and three-dimensional numerical experiments for incompressible flow to show the performance of these numerical schemes.

Oral Presentation of Applied Mathematics Session

- **Bao Kunlong, Shanghai University**

Speech Title: A numerical method for the optimal boundary control of a Rayleigh-Bishop beam

Abstract: The paper is dedicated to addressing the boundary control problem aimed at suppressing vibration in a Rayleigh-Bishop beam. The dynamic of the Rayleigh-Bishop cantilever beam is presented as a pseudohyperbolic equation, which describes the vibration of the Rayleigh-Bishop beam. Then by means of the Hermite finite element method (FEM), we formulate an optimization problem aimed at determining the feedback gain matrices. Finally, the numerical simulation experiment is carried out to verified the effectiveness of the proposed method.

- **Chen Jiang, Shanghai University**

Speech Title: Backstepping boundary control for the Rayleigh-Bishop beam

Abstract: This paper presents that a boundary feedback controller is proposed to stabilize the Rayleigh-Bishop beam system. Firstly, we transform the initial equation into a second-order hyperbolic equation. Secondly, by using a backstepping integral coordinate transformation, we transforms the simplified second-order hyperbolic equation into a stable target system. Meanwhile, a gain kernel equation will be generated during the conversion process. By solving the gain kernel equation, our goal is to design the controller based on information from the gain kernel. Finally, simulation results demonstrate the effectiveness of our designed controller.

Oral Presentation of Applied Mathematics Session

➢ **Ma Xin, Novosibirsk State University**

Speech Title: On the solvability of the first boundary value problem for one pseudohyperbolic equation of the sixth order

Abstract: In this paper we investigate the first boundary value problem in a cylinder for a pseudohyperbolic equation of the sixth order. This equation is unsolvable with respect to the highest time derivative. In one-dimensional case, it describes the propagation of waves with consideration of the surface tension. We define the generalized solution of the corresponding boundary value problem, prove the existence and uniqueness of the generalized solution in Sobolev space, and obtain estimates of the solution.

The work is supported by the Mathematical Center in Akademgorodok under agreement No. 075-15-2022-282 with the Ministry of Science and Higher Education of the Russian Federation.

➢ **Xin Liyue, Novosibirsk State University**

Speech Title : Estimates for solutions to one class of functional difference equations

Abstract: We consider classes of systems of inhomogeneous functional difference equations. We indicate conditions under which solutions to the systems tend to zero at infinity and establish estimates for the solutions.

Oral Presentation of Computational Modeling Session

- **Dong Sizhou, DFH Satellite Co., Ltd.**

Speech Title: Research on Satellite Unidirectional Random Vibration Test Method Based on Vibration Fatigue Equivalence

Abstract: This article conducts a study on the unidirectional random vibration testing method based on vibration fatigue equivalence for batch production satellites, aiming to optimize the mechanical testing project of batch production satellites and reduce satellite development costs. This article first starts from the frequency domain vibration fatigue analysis method and constructs a relationship model between the number of acceleration cycles and the duration of the test; Then, based on the model of the relationship between the number of acceleration cycles and the duration of the experiment, the response of the satellite in various directions during the noise test was taken as a reference. The random vibration test and the noise test were analyzed for the number of acceleration cycles and the duration of the experiment; Finally, a unidirectional random vibration test method for batch production satellites was obtained.

- **Liao Yilong, Shanghai University**

Speech Title: Distributed feedback design in heating process control

Abstract: In our paper, we designed a distributed feedback control law for a fluid heating model, which described by a one-dimensional first-order hyperbolic equation. This equation has a non-local boundary condition with a time-delay terms. Further, according to geometric control theory, the distributed feedback control law ensures the exponential stability and the input-output stability in a closed-loop system. Finally, we evaluate the proposed controller performances by solving tracking and disturbance rejection problems through numerical simulation, and we compared the simulation results with the optimal control method.

Oral Presentation of Computational Modeling Session

➢ **Lv Longjie, Dalian Maritime University**

Speech Title: Numerical study on the effect of viscous dissipation on natural convection in a tilted square cavity filled with nanofluids

Abstract: The viscous dissipation leads to changes in the temperature, viscosity, heat transfer and other physical properties of the fluid during the flow process, thereby affecting the flow characteristics. And it plays an important role in damping effect, momentum transfer and energy dissipation. Therefore, more in-depth research is needed to reveal the importance of viscous dissipation in natural convection. In this work, the effects of viscous dissipation on the flow and heat transfer of nanofluid natural convection in a tilted square cavity are numerically studied by applying a newly proposed fractional-step semi-implicit algorithm with the numerical advantage of larger time steps. The cavity is filled with water and nanoparticles of copper (Cu), and the viscous dissipative behavior of the mixture flow is not negligible. This study has been conducted for certain pertinent parameters of Rayleigh number ($Ra=10^4$ and 10^5), Prandtl number ($Pr=6.2$), Eckert number ($Ec=0-2$), the volume fraction of solid particles ($\emptyset=0-0.06$), and inclination angle of square cavity ($\alpha=0-\pi/2$).

Oral Presentation of Computational Modeling Session

➢ **Wei Mingyue, Dalian Maritime University**

Speech Title: Numerical Simulation of Heat Transfer in Multilayer Cookware

Abstract: The heat conduction in multilayer media is an important topic in physics and materials. Multi-medium heat transfer is widely used in spacecraft thermal control, electronic equipment heat dissipation and material performance evaluation. In this paper, the finite element method is mainly used to solve the two-dimensional unstable heat conduction problem related to time. By relying on Fourier's heat conduction law and Newton's cooling law, the optimal combination of materials selection for a saucepan composed of three layers of media and the optimal value of each layer thickness problem are explored.

The study found that the bottom of the pan should choose high conductivity metal to accelerate heat transfer. The heat transfer of multilayer medium is more stable than that of single-layer material. The optimal material combination of the first layer is copper, the second layer is chromium-nickel alloy and the third layer is stainless steel. The optimal thickness combination is 0.008m for the bottom layer, 0.001m for the middle layer and 0.001m for the upper layer.

Oral Presentation of Computational Modeling Session

➢ **Zhuang Kefeng, Dalian Maritime University**

Speech Title : Heatline visualization of natural convection in an isosceles trapezoidal porous cavity filled with non-Newtonian nanofluids

Abstract: The problem of natural convection in an isosceles trapezoidal porous cavity filled with non-Newtonian nanofluids is visualized by heatline. Water-based nanofluids with copper nanoparticles are investigated. The governing equations are solved numerically using the Galerkin Finite Element Method. This study has been conducted for the certain pertinent parameters of Rayleigh number, Darcy number, power-law index, the inclination angle of the cavity and nanoparticle volume fraction, and the side wall inclination angle is fixed at 21.6°. The effects of the various parameters mentioned above on streamlines, isotherms and overall heat transfer are discussed. Results indicate that adding water-based nanofluids with copper nanoparticles significantly increases heat transfer. When other conditions are consistent, With the increase of the power law index the maximum streamfunction decreases, and the local and average Nusselt numbers on the hot wall decrease; With the increase of Darcy number, the maximum streamfunction increases, and the local and average Nusselt numbers on the hot wall increase, and when Darcy number is too small, the power law index has no significant effect on convection. In addition, convective heat transfer is also affected by the variation of the inclination angle of the cavity.

Oral Presentation of Computational Modeling Session

➢ **Chen Zhangxing, China Productivity Center for Machinery Co., Ltd., China Academy of Machinery Science & Technology Group Co., Ltd.**

Speech Title: A method for calculating the allowable crack size of the main pipeline for a certain PWR

Abstract: To determine the allowable crack size of the main coolant pipeline, the FEM method was first utilized to perform the stress distribution analysis on the main coolant pipeline under conditions such as pressure test, normal operation condition plus safe shutdown earthquake load, then the maximum stress intensity at the weld of the main coolant pipeline was obtained by using theoretical formulas. Subsequently, the NRC ring-shaped crack pipe analysis method based on plastic fracture theory was performed to calculate the critical size of semi-elliptical cracks on the inner surface of the pipe under different conditions. Finally, based on the stress intensity calculation results and fatigue crack propagation, the amount of expansion of standard postulated semi-elliptical cracks on the inner surface of pipe over a 40-year lifetime was calculated. The results show that within the 40-year lifetime, the size of the postulated initial crack plus expansion is far smaller than the corresponding critical crack size. It can be considered that the postulated initial crack will not lead to fatigue failure of the pipe, and thus the initial crack size used in fatigue crack expansion calculations can be considered as the allowable crack size for the pipe. In this paper, the cold leg of the main coolant pipeline in a certain nuclear power plant was studied.

➢ **Yuanhai Mu, Novosibirsk State University**

Speech Title: Estimates for solutions in one predator-prey model with delay

Abstract: We consider the predator-prey model described by a system of differential equations with delay. The non-negativity and boundedness of solutions are proved, equilibrium points are found, conditions for the asymptotic stability of equilibrium points are obtained, attraction domains are indicated and estimates for solutions are established. The results are obtained using the Lyapunov-Krasovskii functional proposed by G.V.Demidenko and I.I.Matveeva.

Oral Presentation of Computational Modeling Session

- **Wang Siying, Communication University of China**

Speech Title: A study on players' momentum based on strategy and psychology: a perspective from physics

Abstract: The study of momentum has become pivotal in understanding the progress and mastering the dynamics of sports matches. This paper, from a physics perspective, proposes a method to quantify momentum in matches through both strategic and psychological dimensions. Strategically, performance metrics are weighted using the Analytic Hierarchy Process (AHP). Psychologically, a Markov chain is employed to describe changes in the situation of play. Findings from CatBoost and logistic regression reveal that momentum serves a significant mediating role. Applying the model to men's and women's tennis as well as men's table tennis matches, the study identifies differences in the fluctuations and impacts of momentum across various types of competitions. The conclusions of this paper hold substantial significance for both academia and players in enhancing their understanding and utilization of momentum.

- **Zhao Ningning, Beijing University of Technology**

Speech Title: Fixed-time Synchronization of Delayed MAM Neural Networks with Impulsive Disturbance

Abstract: A model of multidirectional associative memory neural networks (MAMNNs) with impulses and time-varying delays is established, and fixed-time synchronization is explored. Firstly, a novel fixed-time stability theorem of impulsive dynamical systems is proposed and a new upper bound of settling time is estimated by using the average impulsive interval and comparison principle. Then, based on the improved fixed-time stability theorem and a simple state feedback controller, some sufficient conditions are deduced to guarantee fixed-time synchronization of the derive-response systems. Moreover, compared with the existing results, the upper bound estimation of settling time in this paper is less conservative and more accurate. Finally, a numerical simulation is provided to verify the effectiveness of the theoretical results.

Oral Presentation of Computational Modeling Session

➢ **Zhang Shuzhen, Beijing University of Technology**

Speech Title: The initial value problem for the equations of motion of fractional compressible viscous fluids

Abstract: In this paper we consider the initial value problem to the fractional compressible isentropic generalized Navier-Stokes equations for viscous fluids with one Levy diffusion process in which the viscosity term appeared in the fluid equations is described by the nonlocal fractional Laplace operator. We give one detailed spectrum analysis on a linearized operator and the decay law in time of the solution semigroup for the linearized fractional compressible isentropic generalized Navier-Stokes equations around a constant state by the Fourier analysis technique, which is shown that the order of the fractional derivatives plays a key role in the analysis so that the spectrum structure involved here is more complex than that of the classical compressible Navier-Stokes system. Based on this and the elaborate energy method, the global-in-time existence and one optimal decay rate in time of the smooth solution are obtained under the assumption that the initial data are given in a small neighborhood of a constant state.

Poster

- **Bao Kunlong, Shanghai University**

Title: A numerical method for the optimal boundary control of a Rayleigh-Bishop beam

- **Chang Yuhan, Xinjiang University**

Title: A probability prediction model for flood A probability prediction model for flood disasters based on Multi-layer Perceptron

- **Chen Fan, Beijing University Of Technology**

Title : Discontinuous galerkin method for nonlinear quasi-static poroelasticity problems

- **Chen Hao, Chongqing Jiaotong University**

Title: A blow-up criterion for three-dimensional compressible viscous isentropic magnetohydrodynamic equations

- **Chen Jiang, Shanghai University**

Title: Backstepping boundary control for the Rayleigh-Bishop beam

- **Chen Ke, North China Electric Power University**

Title: Fast L1 compact difference methods for the time-fractional Burgers-Fisher equation

- **Chen Xiaoyu, Dalian Maritime University**

Title : Second order directional differential stability of convex optimization problems

- **Deng Zicong, Guangzhou Vocational College of Technology & Business**

Title: The inviscid limit of the incompressible micropolar system in R^3

Poster

- **Zhai Kunzhi, Civilaviation Flight University of China**

Title: A method for simulating population size of lampreys based on an improved lotka-volterra model

- **Feng Yongxiu, Dalian Maritime University**

Title: A proximal bundle technique for solving the equilibrium problems with inexact information

- **Zhai Kunzhi, Civilaviation Flight University of China**

Title: Impacts of changes in the sex ratio of the lamprey on itself and the ecosystem

- **Gao Su, Shandong Management University**

Title: A hierarchical sorting method based on hierarchical clustering and its application in port evaluation

- **Huang Zirui, Jinan University**

Title: BP neural network model in forecasting carbon peaking—take the yangtze river delta region as an example

- **Jia Xueqing, North China Electric Power University**

Title: Exploring the impact of chiral phase transition on axion adopting the three flavour Nambu-Jona-Lasinio model

- **Li Wenhao, University of Jinan**

Title: Two necessary and sufficient conditions for the completeness of $L^1(c)$ space

- **Liao Yilong, Shanghai University**

Title: Distributed feedback design in heat process control

Poster

- **Niu Yiyi, Beijing University Of Technology**

Title : A second-order exponential time differencing multi-step energy stable scheme for swift-hohenberg equation with quadratic-cubic nonlinear term

- **Pang Zhihong, Westlake University**

Title: A novel way for generating special surfaces

- **Yang Yunfeng, Northeast Petroleum University**

Title : All exact solutions to the generalized Maccari system with power law nonlinearity

- **Zhang Rong, West Anhui University**

Title: The dynamic of two species Lotka-Volterra amensalism model with wind effect

- **Zhao Shuzhang, Dalian Maritime University**

Title: LDPSR: A Super Resolution Network Featuring the Lightweight Duplication Plugin

- **Zhong Qin, SCU Jingjiang College**

Title: Notes on the minimum eigenvalue of the fan product

- **Zhong Qin, SCU Jingjiang College**

Title: A new algorithm for deter mining the minimum eigenvalue of Ir reducible z-matrices

Appendix

- Notes
- About Dalian

Notes

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Notes

About Dalian

Dalian is located at the southern tip of Northeast China, adjacent to the Yellow Sea and the Bohai Sea. It is a sub-provincial city and an important port city in Liaoning Province. With its beautiful natural environment, advantageous geographical location, and rich historical and cultural heritage, Dalian is known as the "Window to the Northeast" and "City of Romance."

The climate in Dalian is classified as a temperate monsoon climate, characterized by mild winters and cool summers, with distinct seasons, making it particularly suitable for living and travel. The people of Dalian are warm and friendly, the urban environment is clean and orderly, and cultural life is vibrant. The annual Dalian International Beer Festival in summer attracts visitors from all over the world, allowing them to experience the city's passion and vitality.

Dalian is not only a tourist destination but also a crucial economic center and port city in Northeast China. Industrial parks like the Binhai New Area and Economic and Technological Development Zone house many high-tech enterprises, driving regional economic growth. Dalian Port, one of the major ports in northern China, connects domestic and international markets, fostering trade and logistics prosperity.

Jinshitan National Tourist Resort

Located 50 kilometers from Dalian's city center, is renowned for its stunning coastal scenery and unique geological formations. The resort features a golden beach, intriguing rock formations in the geological park, and various recreational activities such as boating, golfing, and hiking.

Xinghai Square

The largest city square in Asia, is a landmark in Dalian. Covering an area of 1.1 million square meters, the square features impressive sculptures, landscaped gardens, and a large musical fountain. The square hosts numerous cultural and commercial events, including the annual Dalian International Beer Festival.

Host: Dalian Maritime University

Organizer: School of Science, Dalian Maritime University

Co-organizers: Shanghai Customs College

Mathematical Center in Akademgorodok

Liaoning Mathematical Society

Dalian Mathematical Society

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