China-Central Asia Joint Meeting in Mathematics

September 15-20, 2019, Sichuan University, Chengdu, China

中国中亚数学联合会议

2019 年 9 月 15 – 20 日 中国 成都 四川大学

Contents

1 General information

The China-Central Asia Joint Meeting in Mathematics is a series of conferences that bring together mathematicians in all fields of mathematics from China and Central Asian countries to exchange new achievements, to collaborate on scientific researches, and to develop friendships.

The 2019 China-Central Asia Joint Meeting in Mathematics will be held in Sichuan University, Chengdu, China. It consists of 5 sessions:

- Algebra and Functional Analysis;
- Differential Equations, Dynamical Systems and Mathematical Physics;
- Complex Analysis, Geometry and Topology;
- Probability Theory and Statistics;
- Applied, Computational, Industrial and Engineering Mathematics.

The scientific programs of the conference will consist of plenary lectures and invited talks.

Scientific Committee

Ayupov, Shavkat (Uzbekistan Academy of Sciences)

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Li, An-Min (Sichuan University)

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Peng, Liangang (Sichuan University)

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Session Organizers

1. Algebra and Functional Analysis: Fu, Changjian
2. Differential Equations, Dynamical Systems and Mathematical Physics: Lian, Zeng
3. Complex Analysis, Geometry and Topology: Zhang, Bin
4. Probability Theory and Statistics: Pan, Jianxin

5. Applied, Computational, Industrial and Engineering Mathematics: Xie, Xiaoping

Organizing Institutions

Graduate School of Sichuan University

School of Mathematics Sichuan University

Sichuan Province Mathematical Society

Financial Support

Graduate School of Sichuan University

National Natural Science Foundation of China

School of Mathematics, Sichuan University

Sichuan Province Mathematical Society

2 List of Speakers

Algebra and Functional Analysis

Ayupov, Shavkat (Institute of Mathematics, Uzbekistan Academy of Sciences)

Azamov, Nurulla (Flinders University in Adelaide, Australia)

Eshmatov, Farkhod (Sichuan University, China)

Jiang, Xingni (Sichuan University, China)

Khudoyberdiyev, Abror (National University of Uzbekistan)

Kudaybergenov, Karimbergen (Karakalpak State University, Uzbekistan)

Li, Conghui (Southwest Jiaotong University, China)

Lin, Bingchen (Sichuan University, China)

Liu, Pin (Southwest Jiaotong University, China)

Lu, Ming (Sichuan University, China)

Nurakunov, Anvar (Institute of Mathematics, National Academy of Sciences of Kyrgyz Republic)

Turdibaev, Rustam (Inha University in Tashkent, Uzbekistan)

Uramov, Sabir (University of New Haven, USA)

Xu, Bin (Sichuan University, China)

Yu, Jiayang (Sichuan University, China)

Zelmanov, Efim (University of California-San Diego, USA)

Differential Equations, Dynamical Systems and Mathematical Physics

Agirseven, Deniz (Trakya University, Turkey)

Ashurov, Ravshan (Institute of Mathematics, Uzbekistan Academy of Sciences)

Ashyralyev, Allaberen (Institute of Mathematics and Mathematical Modeling, Kazakhstan)

Azamov, Abdulla (Institute of Mathematics, Uzbekistan Academy of Sciences)

Baizakov, Asan (Institute of Mathematics, National Academy of Sciences of the Kyrgyz Republic)

Durdiev, Durdimurod (Bukhara State University, Uzbekistan)

Hu, Wengui (Sichuan University, China)

Ilolov, Mamadsho (Institute of Mathematics, Tajikistan Academy of Sciences)

Iskhokov, Sulaimon (Institute of Mathematics, Tajik Academy of Science)

Kuchakshoev, Kholiknazar (University of Central Asia, Tajikistan)

Lakaev, Saidakhmat (Samarkand State University & Uzbekistan Academy of Sciences)

Li, Dingshi (Southwest Jiaotong University, China)

Liu, Jianjun (Sichuan University, China)

Wang, Xiaohu (Sichuan University, China)

Yang, Lei (Sichuan University, China)

Yan, Jingzhi (Sichuan University, China)

Zhu, Changrong (Chongqing University, China)

Complex Analysis, Geometry and Topology

Abdullayev, Fahreddin (Kyrgyz-Turkey Manas University, Kyrgyzstan & Mersin University, Turkey)

Bellitir, Houda (Sichuan University, China)

Borubaev, Altay (Institute of Mathematics, National Academy of Sciences of Kyrgyz Republic)

Chekeev, Asylbek (Balasagyn Kyrgyz National University, Kyrgyzstan)

Chen, Youming (Chongqing University of Technology, China)

Du, Chengyong (Sichuan Normal University, China)

Fan, Huijun (Peking University, China)

Gao, Yan (Sichuan University, China)

Karimov, Umed (Institute of Mathematics, Tajik Academy of Science)

Li, Binru (Fudan University, China)

Sadullaev, Azimbay (National University of Uzbekistan)

Sheng, Li (Sichuan University, China)

Sun, Shanzhong (Capital Normal University, China)

Usmanov, Zafar (Institute of Mathematics, Tajik Academy of Sciences)

Zaitov, Adibek (Tashkent Institute of Architecture and Civil Engineering, Uzbekistan)

Zhou, Jiazu (Southwest University, China)

Probability Theory and Statistics

Ai, Mingyao (Peking University, China)

Chen, Songxi (Peking University, China)

Iskandar, Sattarov (Institute of Mathematics, Uzbekistan Academy of Sciences)

Mirakhmedov, Sherzad (Institute of Mathematics, Uzbekistan Academy of Sciences)

Rozikov, Utkir (Institute of Mathematics, Uzbekistan Academy of Sciences)

Sharipov, Olimjon (National University of Uzbekistan)

Wang, Longmin (Nankai University, China)

Wang, Qihua (Chinese Academy of Sciences)

Yang, Xue (Tianjin University, China)

Zhang, Riquan (East China Normal University, China)

Zhou, Xiaohua (Peking University, China)

Applied, Computational, Industrial and Engineering Mathematics

Aripov, Mersaid (National University of Uzbekistan)

Ashyralyev, Allaberen (Institute of Mathematics and Mathematical Modeling, Kazakhstan)

Azamov, Abdulla (Institute of Mathematics, Uzbekistan Academy of Sciences)

Chen, Gang (Sichuan University, China)

Duan, Huoyuan (Wuhan University, China)

Gong, Wei (Chinese Academy of Sciences)

He, Qiaolin (Sichuan University, China)

Soleev, Akhmadjon (Samarkand State University, Uzbekistan)

Tang, Qinglin (Sichuan University, China)

Wang, Hao (Sichuan University, China)

Zhang, Shiquan (Sichuan University, China)

Zhou, Tao (Chinese Academy of Sciences)

3 Schedule

Opening and Closing (Vunue: Bai Yun Hall, 7th Floor)					
Time	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-09:50	Opening				
10:00-10:50	Zelmanov, Efim				
11:10-12:00	Ayupov, Shavat				
12:00	Lunch				
14:30-15:20				Borubaev, Altay	
15:30-16:20				Fan, Huijun	
16:40-17:30				Ilolov, Mamadsho	
17:40-18:30				Closing	
18:30	Banquet	Dinner			

Session 1: Algebra and Functional Analysis (Vunue: Xiang Yun Hall, 7th Floor)					
Time	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-09:50	Opening	Turdibaev, Rustam		Yu, Jiayang	Free discussion
10:00-10:50	Plenary talks	Lin, Bingchen		Eshmatov, Farkhod	
11:10-12:00		Uramov, Sabir		Xu, Bin	
12:00	Lunch				
14:30-15:20	Khudoyberdiyev, Abror	Kudaybergenov, Karimbergen	Free discussion	Plenary talks	Free discussion
15:30-16:20	Lu, Ming	Li, Conghui			
16:40-17:30	Nurakunov, Anvar	Azamov, Nurulla			
17:40-18:30	Liu, Pin	Jiang, Xingni		Closing	
18:30	Banquet	Dinner			

Session 2: Differential Equations, Dynamical Systems and Mathematical Physics (Venue: Bai Yun Hall, 7th Floor)					
Time	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-09:50	Opening	Yan, Jingzhi	Ashurov, Ravshan	Lakaev, Saidakhmat	Free discussion
10:00-10:50	Plenary talks	Jenaliyev, Muvasharkhan	Li, Dingshi	Kuchakshoev, Kholiknazar	
11:10-12:00		Liu, Jianjun	Baizakov, Asan	Iskhokov, Sulaimon	
12:00	Lunch				
14:30-15:20	Azamov, Abdulla	Hu, Wengui	Free discussion	Plenary talks	Free discussion
15:30-16:20	Wang, Xiaohu	Yang, Lei			
16:40-17:30	Ashyralyev, Allaberen	Durdiev, Durdimurod			
17:40-18:30	Agirseven, Deniz	Zhu, Changrong		Closing	
18:30	Banquet	Dinner			

Session 3: Complex Analysis, Geometry and Topology (Venue: Teng Yun Hall, 6th Floor)					
Time	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-09:50	Opening	Sun, Shanzhong		Li, Binru	Free discussion
10:00-10:50	Plenary talks	Usmanov, Zafar		Karimov, Umed	
11:10-12:00		Chen, Youming		Zhou, Jiazu	
12:00	Lunch				
14:30-15:20	Chekeev, Asylbek	Gao, Yan	Free discussion	Plenary talks	Free discussion
15:30-16:20	Sheng, Li	Sadullaev, Azimbay			
16:40-17:30	Zaitov, Adibek	Du, Chengyong			
17:40-18:30	Abdullayev, Fahreddin	Bellitir, Houda		Closing	
18:30	Banquet	Dinner			

Session 4: Probability Theory and Statistics (Venue: Qing Yun Hall, 5th Floor)					
Time	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-09:50	Opening	Zhou, Xiaohua		Zhang, Riquan	Free discussion
10:00-10:50	Plenary talks	Mirakhmedov, Sherzad		Iskandar, Sattarov	
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12:00	Lunch				
14:30-15:20	Chen, Songxi	Wang, Qihua	Free discussion	Plenary talks	Free discussion
15:30-16:20	Yang, Xue	Sharipov, Olimjon			
16:40-17:30	Rozikov, Utkir	Wang, Longmin			
17:40-18:30				Closing	
18:30	Banquet	Dinner			

Session 5: Applied, Computational, Industrial and Engineering Mathematics (Venue: Ling Yun Hall, 4th Floor)					
Time	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-09:50	Opening	Zhou, Tao		Zhang, Shiquan	Free discussion
10:00-10:50	Plenary talks	Ashyralyev, Allaberen		Duan, Huoyuan	
11:10-12:00				Tang, Qinglin	
12:00	Lunch				
14:30-15:20	Soleev, Akhmadjon	Chen, Gang	Free discussion	Plenary talks	Free discussion
15:30-16:20	He, Qiaolin	Aripov, Mersaid			
16:40-17:30	Azamov, Abdulla	Wang, Hao			
17:40-18:30	Nie, Yufeng	Gong, Wei		Closing	
18:30	Banquet	Dinner			

4 Titles and abstracts

Plenary talks

Opening and Closing (Vunue: Bai Yun Hall, 7th Floor)					
Time	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-09:50	Opening				
10:00-10:50	Zelmanov, Efim				
11:10-12:00	Ayupov, Shavat				
12:00	Lunch				
14:30-15:20				Borubaev, Altay	
15:30-16:20				Fan, Huijun	
16:40-17:30				Ilolov, Mamadsho	
17:40-18:30				Closing	
18:30	Banquet	Dinner			

Ayupov, Shavkat (Uzbekistan Academy of Sciences)

Local and 2-local Derivations and Automorphisms of Lie Algebras

Abstract: Given an algebra A, a linear mapping $T : A \to A$ is called an automorphism (respectively, a derivation) if $T(ab) = T(a)T(b)$ (respectively, $T(ab) = T(a)b + aT(b)$) for all a, b in A.

A linear operator $\Delta : A \to A$ is called a local automorphism (respectively, a local derivation) if for every x in A there exists an automorphism a_x (respectively, a derivation d_x on A depending on x, such that $\Delta(x) = a_x(x)$ (respectively, $\Delta(x) = d_x(x)$).

A mapping $\Delta : A \to A$ (not linear in general) is called a 2-local automorphism (respectively, a 2-local derivation) on A, if for every x, y in A there exists an automorphism $a_{x,y}$ (respectively, a derivation $d_{x,y}$ on A depending on x and y, such that $\Delta(x) = a_{x,y}(x)$, $\Delta(y) = a_{x,y}(y)$ (respectively, $\Delta(x) = d_{x,y}(x)$ and $\Delta(y) = d_{x,y}(y)$). The main problems concerning the above notions are to find conditions under which every local (or 2-local) automorphism or derivation automatically becomes an automorphism (respectively, a derivation), and to present examples of algebras with local and 2-local automorphisms (respectively, derivations) that are not automorphisms (respectively, derivations). In the present talk we consider these problems in the framework of finite- and infinite-dimensional Lie algebras over algebraically closed fields of characteristic zero.

Complete solutions of the above problems are obtained for local and 2-local derivations and 2-local automorphisms on finite-dimensional Lie algebras.

We also consider these problems for certain infinite-dimensional Lie algebras. We show that all

2-local derivations on the Witt algebra as well as on the positive Witt algebra and on the classical one-sided Witt algebra are (global) derivations. We also give an example of infinite-dimensional Lie algebra (so-called *thin Lie algebra*) which admits a 2-local derivation which is not a derivation.

Borubaev, Altay (Kyrgyzstan Academy of Sciences)

On uniform structures in real complete spaces

Abstract: In this paper, considers uniform analogues of real complete extensions of Tychonoff spaces by means of uniform structures. Real complete spaces were introduced by E. Hewitt [1]. The main properties of real complete or in other terminology Hewitt-complete spaces are described in the book [2]. Maximal real complete extensions of Tychonoff spaces are called Hewitt extensions. Tychonoff spaces were first constructed by E. Hewitt [1]. An analysis of uniform analogues of the most important classes of topological spaces and the construction of all extensions Tychonoff spaces are considered in [3]. Real full extensions are considered in [4].

Definition 1. A uniform space (X, U) is called a uniformly functional space, and the uniformity U is functional if the uniformity U is generated by some family of functions $C_U(X)$, i.e. U is generated by a family of coverings of the form $(f\alpha : f \in C_U(X), \alpha \in E_{\mathbb{R}})$, where $f : X \to \mathbb{R}$, and $E_{\mathbb{R}}$-natural uniformity of the number line $\mathbb{R}$.

Proposition 1. For every uniformity of U on X, existence uniformity of U_F on X such that U_F is the maximum functional uniformity contained in the uniformity of U.

Definition 2. A uniform space (X, U) is called **uniformly real complete** if it is uniformly functionally and complete.

Theorem 1. Let (X, U) be a uniformly function space. Then its completion $(\tilde{X}, \tilde{U})$ is uniformly real complete, and its topological space (X, τ_U) will be real complete spaces.

Theorem 2. For each uniform space (X, U) there is exactly one (up to a uniform homeomorphism) uniformly real-complete space $(\theta_U X, \theta_U)$ with the following properties:

(1) There is a uniformly homeomorphic enclosure $i : (X, U_F) \to (\theta_U X, \theta_U)$, for which $(\theta_U X, \theta_U)$ is the completion of the uniform space (X, U_F), where U_F is the maximum functional uniformity contained in U.

(2) For any continuous function $f : (X, U) \to (\mathbb{R}, E_{\mathbb{R}})$, there is a uniformly continuous function $\tilde{f} : (\theta_U X, \theta_U) \to (\mathbb{R}, E_{\mathbb{R}})$ such that $\tilde{f} i = f$.

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[1] Edwin Hewitt. Rings of real-valued continuous functions I. Transactions of the American Mathematical Society 64(1948), 45-99.

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[3] Borubaev A.A. Ravnomernaya topologiya. Bishkek. Izdatelstvo "Ilim" 2013.

[4] Aparina L.V. Hewitovskie rasshireniya blizostnych I ravnomernych prostranstv Sibirskii mat. jurnal.–1974.-T.15.-No. 4.-P.707-729.

Fan, Huijun (Peking University, China)

TBA

Ilolov, Mamadsho (Tajikistan Academy of Sciences)

Fractional Integro-Differential Inclusions of Hale type in Banach Space

Abstract: In this presentation, we establish existence results for mild solutions of fractional integro-differential inclusions of Hale type in Banach space. Our investigations based on fractional calculus,multivalued mapping and Darbo-Sadovskii's fixed point theorem. Also, we present an example to illustrate the theoretical results.

Zelmanov, Efim (University of California-San Diego, USA)

Growth of Algebraic Structures

Abstract: All infinite structures with finitely many generators have their own ways of growth. We will discuss growth functions of algebras, monoids and languages.

Session 1. Algebra and Functional Analysis

Session 1: Algebra and Functional Analysis (Vunue: Xiang Yun Hall, 7th Floor)					
Time	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-09:50	Opening	Turdibaev, Rustam		Yu, Jiayang	Free discussion
10:00-10:50	Plenary talks	Lin, Bingchen		Eshmatov, Farkhod	
11:10-12:00		Uramov, Sabir		Xu, Bin	
12:00	Lunch				
14:30-15:20	Khudoyberdiyev, Abror	Kudaybergenov, Karimbergen	Free discussion	Plenary talks	Free discussion
15:30-16:20	Lu, Ming	Li, Conghui			
16:40-17:30	Nurakunov, Anvar	Azamov, Nurulla			
17:40-18:30	Liu, Pin	Jiang, Xingni		Closing	
18:30	Banquet	Dinner			

Azamov, Nurulla (Flinders University in Adelaide, Australia)

Flow of singular spectrum

Abstract: In spectral theory of self-adjoints operators on a Hilbert space two major classes of problems are finding components of spectrum of a self-adjoint operator, such as absolutely continuous (a.c.), singular and discrete spectra, and finding out how they change when the self-adjoint operator undergoes a perturbation. One of the main targets of this theory is a study of the Schrödinger operator $-\Delta + V_0(x)$ acting on $L_2(\mathbb{R}^\nu)$, $\nu = 1, 2, \dots$. For instance, the Schrödinger operator with bounded random potential $V_0(x)$ models a disordered quantum solid body, and the celebrated Anderson localisation asserts that the bottom part of the spectrum of such operator is pure point, see e.g. [1]. As another example, it is a classical result of the potential scattering theory that if a Schrödinger operator $-\Delta + V_0(x)$ with bounded potential undergoes a perturbation by a quick fall-off potential then the absolutely continuous spectrum, including its multiplicities, of the operator is preserved.

Given a Hamiltonian H_0 and a relatively trace class self-adjoint operator V one the main concepts reflecting the change of the spectrum of H_0 is the Lifshitz-Krein spectral shift function (SSF), $\xi(\lambda; H_1, H_0)$, where $H_1 = H_0 + V$, which can be defined as a measure by the Birman-Solomyak formula

$$\xi(\phi) = \int_0^1 \mathrm{Tr}(E_{\mathrm{supp}\phi}(H_r) V \phi(H_r))\, dr, \quad \phi \in C_c(\mathbb{R}),$$

where $H_r = H_0 + rV$, and $E_{(.)}(H)$ is the spectral resolution of H. This measure is absolutely continuous and its density we denote $\xi(\lambda; H_1, H_0)$. Outside the common essential spectrum, σ_{ess}, of the operators H_r, the SSF coincides with another celebrated notion of spectral theory and global analysis, — the spectral flow, [2, 6], and thus is naturally integer-valued there. Inside the essential spectrum the SSF is not integer-valued since it takes into account the movement, or

rather phase shift, of the a.c. spectrum. However, one can consider the decomposition of SSF, a la Lebesgue decomposition of a measure, into the a.c. and singular components, denoted $\xi^{(a)}$ and $\xi^{(s)}$ respectively. These components can be defined, as measures, by the formulas

$$\xi^{\#}(\phi) = \int_0^1 \operatorname{Tr}(E^{\#}_{\operatorname{supp}\phi}(H_r)V\phi(H_r)\,dr, \quad \phi \in C_c(\mathbb{R}),$$

where the placeholder # should be replaced by (a), respectively, (s), for the a.c., respectively, singular, SSF, and where $E^{(a)}_{(\cdot)}(H)$ and $E^{(s)}_{(\cdot)}(H)$ are respectively the a.c. and singular components of the spectral resolution of H. It is probably worth emphasising that both measures $\xi^{(a)}$ and $\xi^{(s)}$ are absolutely continuous, and the words "a.c. and singular SSF" *do not refer* to the Lebesgue decomposition of the spectral shift measure ξ (it is absolutely continuous and such a decomposition is trivial and futile). However, this word usage while being a little misleading at first is convenient and we will use it. The densities of the measures $\xi^{\#}(\phi)$ we denote $\xi^{\#}(\lambda) = \xi^{\#}(\lambda; H_1, H_0)$.

It turns out that the function $\xi^{(s)}(\lambda; H_1, H_0)$ is *integer-valued* for a.e. λ including those λ within the essential (and in particular continuous) spectrum. This result for trace class V was proved in [3] and for resolvent comparable pairs (that is, with $(H_0 - i)^{-1} - (H_1 - i)^{-1}$ trace class) in [5]. One proof consists in establishing a modified Birman-Krein formula $\det S(\lambda) = e^{-2\pi i\xi^{(a)}(\lambda)}$, where $S(\lambda)$ is the scattering matrix of the pair H_0 and H_1, which, when combined with the Birman-Krein formula $\det S(\lambda) = e^{-2\pi i\xi(\lambda)}$, immediately implies $\xi^{(s)}(\lambda) \in \mathbb{Z}$.

However, there is another proof [4, 5] which has that advantage that it provides an essentially more tangible representation of the singular SSF, as a *total resonance index*. For any $s \in \mathbb{R}$ eigenvalues of the compact operator $R_z(H_0 + sV)V$ have the form $(s - r_z^j)^{-1}$, $j = 1, 2, \dots$, where r_z^j are complex numbers which do not depend on s. These numbers we call *coupling resonance points* or, often, simply resonance points, of the pair (H_0, V). Let $\lambda \in \mathbb{R}$. For a real number r_λ the *resonance index*,

$$\operatorname{ind}_{res}(\lambda; H_{r_\lambda}, V),$$

of the triple $(\lambda; H_0 + r_\lambda V, V)$ is the number $N_+ - N_-$ where $N_\pm$ is the number of resonance points of (H_0, V) which approach the real number r_λ as $z = \lambda + iy \to \lambda + i0$, from the upper and lower half-planes respectively. For resolvent comparable pairs the resonance index is a well-defined finite number for a.e. λ and the following equality holds [4, 5]

$$\xi^{(s)}(\lambda; H_1, H_0) = \sum_{r_\lambda \in [0,1]} \operatorname{ind}_{res}(\lambda; H_{r_\lambda}, V).$$

Here the sum is finite since the set of resonance points r_z^j for a given z is the set of poles of a meromorphic function $s \mapsto R_z(H_0 + sV)V$ and thus is a discrete subset of $\mathbb{C}$.

In the light of these results the function $\xi^{(s)}(\lambda)$ ought to be interpreted as *flow of singular spectrum* of a self-adjoint operator H_0 through a point λ on the spectral axis as H_0 undergoes a perturbation to $H_1 = H_0 + V$ along the straight line $H_0 + rV, r \in \mathbb{R}$.

The very existence of the function $\xi^{(s)}$ has certain implications for the behaviour of the singular spectrum. In this talk I will discuss the above mentioned results and announce some new results which have not yet been made publicly available in any form, such as *relative stability of singular spectrum*.

Reference

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[2] M.Atiyah, V.Patodi, I. M. Singer, Spectral Asymmetry and Riemannian Geometry. III, Math. Proc. Camb. Phil. Soc. 79 (1976), 71-99.

[3] N. A. Azamov, Absolutely continuous and singular spectral shift functions, Dissertationes Math. 480 (2011), 1-102.

[4] N. A. Azamov, Spectral ow inside essential spectrum, Dissertationes Math. 518 (2016), 1-156.

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[6] A. Connes, Noncommutative Geometry, Academic Press, San Diego, 1994.

Eshmatov, Farkhod (Sichuan University, China)

TBA

Abstract:

Jiang, Xingni (Sichuan University, China)

Positive representations of $\mathrm{C}_0(X)$

Abstract: If X is a locally compact Hausdorff space, then a representation of the complex C*-algebra $\mathrm{C}_0(X)$ on a Hilbert space H is given by a spectral measure that takes its values in the orthogonal projections on H. It is natural to ask whether something similar is true for a positive representation of the ordered Banach algebra $\mathrm{C}_0(X)$ on a Banach lattice E. If E is a KB-space (e.g if E is an L^p-space for finite p, or if E is reflexive), then the answer is affirmative: the representation is given by a spectral measure that takes its values in the positive projections on X; see [1]. The proofs in [1] make use of the fact that E is a Banach space, but some results in [1] suggest that a purely order-theoretic more general approach might also be possible. In this lecture, we shall explain that this is indeed the case. As a preparation, we shall sketch an integration theory for measures taking values in a suitable partially ordered vector space E. After that, we shall discuss a Riesz representation theorem for a positive map $T : \mathrm{C}_0(X) \to E$. Under mild conditions, this is given by a positive E-valued measure. In the next step, we apply the previous result to a positive representation $\pi : \mathrm{C}_0(X) \to A$, where A is a suitable partially ordered algebra. In that case, the pertinent positive A-valued measure takes values in the idempotents of A. If A equals the regular operators on a suitable partially ordered vector

space E, then the previous result yields a spectral measure for that takes its values in the positive projections on E. This result has not only the main result in [1] as a special case, but also the aforementioned existence of spectral measures for representations of $\mathrm{C}_0(X)$ on a Hilbert space. This is joint work with Marcel de Jeu.

Reference

[1] M. de Jeu, F. Ruo, Positive representations of $\mathrm{C}_0(X)$: I, Ann. Funct. Anal. 7 (2016), 180-205.

Khudoyberdiyev, Abror (National University of Uzbekistan)

On solvable Leibniz superalgebras

Abstract: Lie superalgebras have been studied as the fundamental algebraic structures behind several areas of mathematical physics in 1970s. Some basic results of Lie superalgebras can be found in [1]. The problem of the description of nilpotent Lie superalgebras with maximal index of nilpotency have been studied in [2].

Leibniz superalgebras are generalizations of the Leibniz algebra, they naturally also generalize Lie superalgebras. Many works have been devoted to the description nilpotent Leibniz superalgebras. In this work we investigate solvable Leibniz superalgebras with given nilradicals. It should be noted that solvable Lie superalgebras with Hiesinberg nilradical investigated in [3]. We describe solvable Leibniz superalgebras such that nilradical is the Lie superalgebra with maximal index of nilpotency.

References

[1] Kac V.G. *Lie superalgebras*, Advances in Math., vol. 26 (1) (1977) 8–96.

[2] Gómez J.R., Khakimdjanov Yu., Navarro R.M. *Some problems concerning to nilpotent Lie superalgebras.* J. Geom. and Phys., 51(4) (2004) 473–486.

[3] Rodriguez-Vallarte M.C., Salgado G. *On indecomposable solvable Lie superalgebras having a Heisenberg nilradical.* J. of Algebra and its Appl. 15(10), (2016).

Kudaybergenov, Karimbergen (Karakalpak State University, Uzbekistan)

Derivations of infinite dimensional central simple regular algebras

Abstract: Given an algebra $\mathcal{A}$, a linear operator $\delta : \mathcal{A} \to \mathcal{A}$ is called a *derivation* if δ satisfies the Leibniz rule, that is, $\delta(xy) = \delta(x)y + x\delta(y)$ for all $x, y \in \mathcal{A}$. Each element a of associative algebra $\mathcal{A}$ implements a derivation $\mathrm{ad}(a)$ on $\mathcal{A}$ defined as $\mathrm{ad}(a)(x) = [a, x] = ax - xa$, $x \in \mathcal{A}$. Such derivations $\mathrm{ad}(a)$ are said to be *inner derivations*.

It is a general algebraic problem to find algebras which admit only inner derivations. Such examples are:

- algebras $B(X)$ of all bounded linear operators on a Banach space X [4, Corollary 3.4];
- simple unital C^*-algebras [8, Theorem];

– von Neumann algebras [7, Theorem 4.1.6];

– finite-dimensional simple central algebras [5, Page 100].

It should be note that the last result concerning derivations finite dimensional central simple algebras is one of many interesting applications of the Skolem-Noether Theorem (see [5]).

What for general (infinite-dimensional) simple algebras, it is not clear under what conditions they admit only inner derivations. It should be noted that Amitzur [1, Corollary 2 of Theorem 5] proved that each simple ring A with a derivation D can be embedded in a simple ring A^* with an inner derivation D^* such that D^* induces D in A.

In the survey [3] the authors considered the problem of innerness of derivations on the algebra $S(M)$ of measurable operators affiliated with a von Neumann algebra M. This problem has been solved for all types of von Neumann algebras except type II_1 case. In the latter case the algebra $S(M)$ coincides with the algebra of all closed operators affiliated with M (this is so called Murray–von Neumann algebra). In [3, Problem 4.8] we suggested the following open problem (see also [2, 6]).

Problem 1. Let M be a type II_1 von Neumann algebra (in particular a II_1-factor). Prove that every derivation on the algebra $S(M)$ is inner, or give an example of a non-inner derivation on $S(M)$.

It is known that for type II_1-factors the algebra $S(M)$ is a central simple algebra which is (von Neumann) regular. In 2016 during the discussion of the above problem in the California University San Diego, the first author and Professor E. Zelmanov posed the following more general problem.

Problem 2. If A is a central simple (von Neumann) regular algebra (or ring) then prove that all derivations on A are inner, or give an example of such (necessary infinite dimensional) algebra with a non-inner derivation.

In the talk we discuss an example of infinite dimensional central simple (von Neumann) regular algebra with outer derivations. Namely, we show that there is a dense in the measure topology $*$-subalgebra of algebra of all measurable operators with respect to a type II_1 hyperfinite factor which admits outer derivations. Moreover, we also show that this algebra admits a continuous (in the measure topology) derivation, generated by a measurable operator, but which is still an outer derivation.

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Li, Conghui (Southwest Jiaotong University, China)

Robinson's conjecture on heights of characters

Abstract: Georey Robinson conjectured in 1996 that the p-part of character degrees in a p-block of a finite group can be bounded in terms of the center of a defect group of the block. By a recent joint work with Z. Feng, Y. Liu, G. Malle, J. Zhang, we prove this conjecture for all odd primes for all finite groups. In this talk, I will give a brief introduction about this conjecture.

Lin, Bingchen (Sichuan University, China)

Archimedean Non-Vanishing and Cohomological Test Vector

Abstract: The standard L-functions of GL_{2n} expressed in terms of the Friedberg-Jacquet global zeta integrals have better structure for arithmetic applications, due to the relation of the linear periods with the modular symbols. In this talk, we will focus on the archimedean local integrals of Friedberg-Jacquet. We will give the explicit construction of uniform cohomological test vector v and establish the non-vanishing property for the archimedean local Friedberg-Jacquet integral when evaluating at v. This is join work with Dihua Jiang and Fangyang Tian.

Liu, Pin (Southwest Jiaotong University, China)

Cluster characters

Abstract: Central in the study of the link between representation theory and cluster algebra are cluster characters. Broadly speaking, they are maps which associate to each module over certain algebras (or object in certain triangulated categories) an element in a certain cluster algebra. In this talk, we will explain how cluster characters can be used to categorify cluster algebras, in particular, skew-symmetrizable cluster algebras with respect to non acyclic initial seeds. This work is joint with C. Fu and S. Geng.

Lu, Ming (Sichuan University, China)

Geometric realization of i-quantum groups

Abstract: A quantum symmetric pair consists of a quantum group and its coideal subalgebra (called an i-quantum group). A quantum group can be viewed as an example of i-quantum

groups associated to symmetric pairs of diagonal type. In recent years, several fundamental constructions (such as canonical bases, R-matrices) for quantum groups have been generalized to the setting of i-quantum groups. In our recent work with W. Wang, we obtained a Hall algebraic realization of i-quantum groups, generalizing the construction of Bridgeland. In this talk, we provide a geometric construction of the universal i-quantum groups and their "dual canonical bases" with positivity, via the quantum Grothendieck rings of Nakajima-Keller- Scherotzke quiver varieties. It can also be viewed as a generalization of Qin's geometric realization of quantum groups. This is a joint work with Weiqiang Wang.

Nurakunov, Anvar (Institute of Mathematics, National Academy of Sciences of Kyrgyz Republic)

Profiniteness in finitely generated varieties is undecidable

Abstract: Profinite algebras are exactly those that are isomorphic to inverse limits of finite algebras. Such algebras are naturally equipped with Boolean topologies. A variety V is standard if every Boolean topological algebra with the algebraic reduct in V is profinite. We show that there is no algorithm which takes as input a finite algebra A of a finite type and decide whether the variety $V(A)$ generated by A is standard. We also show the undecidability of some related properties. In particular, we solve a problem posed by Clark, Davey, Freese and Jackson.

Turdibaev, Rustam (Inha University in Tashkent, Uzbekistan)

Bipartite graphs and the structure of finite-dimensional semisimple Leibniz algebras

Abstract: Given a finite connected bipartite graph, finite-dimensional indecomposable semisimple Leibniz algebras are constructed. Furthermore, any finite-dimensional indecomposable semisimple Leibniz algebra admits a similar construction.

Uramov, Sabir (University of New Haven, USA)

TBA

Abstract:

Xu, Bin (Sichuan University, China)

Special values of L-functions

Abstract: In this talk, we first introduce some basics on L-functions, which are fundamental objects in number theory. Then we talk about some topics related to the special values of L-functions.

Yu, Jiayang (Sichuan University, China)

Cauchy-Kowalevski and Holmgren type theorems with infinite many variables

Abstract: We adopt von Koch and Hilbert's definition of analyticity of functions as monomial expansions. Our Cauchy-Kowalevski type theorem is derived by modifying the classical method of majorants. Based on this result, by employing some tools from abstract Wiener spaces, we establish our Holmgren type theorem.

Session 2. Differential Equations, Dynamical Systems and Mathematical Physics

Session 2: Differential Equations, Dynamical Systems and Mathematical Physics (Venue: Bai Yun Hall, 7th Floor)					
Time	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-09:50	Opening	Yan, Jingzhi	Ashurov, Ravshan	Lakaev, Saidakhmat	Free discussion
10:00-10:50	Plenary talks	Jenaliyev, Muvasharkhan	Li, Dingshi	Kuchakshoev, Kholiknazar	
11:10-12:00		Liu, Jianjun	Baizakov, Asan	Iskhokov, Sulaimon	
12:00	Lunch				
14:30-15:20	Azamov, Abdulla	Hu, Wengui	Free discussion	Plenary talks	Free discussion
15:30-16:20	Wang, Xiaohu	Yang, Lei			
16:40-17:30	Ashyralyev, Allaberen	Durdiev, Durdimurod			
17:40-18:30	Agirseven, Deniz	Zhu, Changrong		Closing	
18:30	Banquet	Dinner			

Agirseven, Deniz (Trakya University, Turkey)

Difference schemes for the delay Schrödinger equation

Abstract: Time delay is a universal phenomenon existing in almost every practical engineering systems (see [1]-[4]). In the present paper, the stable difference schemes for the approximate solution of Schrödinger equations with time delay are investigated. Theorems on stability of difference schemes for Schrödinger differential problems are established. Numerical results are given.

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Ashurov, Ravshan (Institute of Mathematics, Uzbekistan Academy of Sciences)

Solution of the generalized localization problem for spherical partial sums of multiple Fourier series

Abstract: It is well known, that Luzin's conjecture has a positive solution in one dimensional case and in multidimensional case it is still open for the spherical partial sums $S_\lambda f(x)$, $f \in L_2(\mathbb{T}^N)$, while it has the solution for square and rectangular partial sums. Historically progress with solving Luzin's conjecture has been made by considering easier problems. One of such

easier problems for $S_\lambda f(x)$ was suggested by V. A. Il'in in 1968 and this problem is called the generalized localization principle. In this talk we first give a short survey on convergence almost-everywhere of Fourier series, then present a positive solution for the generalized localization problem for $S_\lambda f(x)$.

Ashyralyev, Allaberen (Institute of Mathematics and Mathematical Modeling, Kazakhstan)

On nonlocal singular perturbation hyperbolic problems

Abstract: The role of asymptotic methods in the study of the solutions of various problems for partial differential equations (PDEs) is significant (see, e.g., [1]-[3]). The uniform stable difference schemes for PDEs with a small parameter in the higher order derivative have been investigated by many authors (see, e.g., [4]-[6]).

In the present paper, the abstract nonlocal singular perturbation hyperbolic problem in a Hilbert space with the self adjoint positive definite operator is studied. An asymptotic formula for the solution of this problem with a small ε parameter is established. The high order of accuracy two-step uniform difference schemes for the solution of this problem are presented. The convergence estimates for the solution of these difference schemes are established. In applications, four nonlocal singular perturbation problems are considered.

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Azamov, Abdulla (Institute of Mathematics, Uzbekistan Academy of Sciences)

Quadratic dynamical systems: some results and problems

Abstract: Quadratic systems

$$\dot{x}_k = a^{(k)} + \sum_{i=1}^{d} b_i^{(k)} x_i + \sum_{1\le i\le j\le d} c_{i,j}^{(k)} x_i x_j,\ k = \overline{1,d}$$

occupy important position in the Theory of Dynamical Systems. Importance of this class of equations can be explained by several arguments. One should note firstly the famous problem of A.Poincaré on a number of limit circles that included as to the Hilbert's list and so to S.Smale's

list of open problems. Furthermore, it is well known that many mathematical models in biology, ecology, genetics and economics began being considered in the form of quadratic dynamical systems. It is necessary to remember quadratic systems, demonstrating chaotic behaviour as in Lorentz system. Surveys of most of results on the subject exposed in [1]-[5].

Although quadratic systems has been studying more than century, many problems remain open. For example, we still don't have an accurate proof of existence chaotic behaviour in the Lorentz system or in other of kind ones. Most of papers appeal to computational methods. Here accuracy of such methods including correct proofs of error estimations become very important. In [6] was suggested a new algorithm based on Taylor's formula allowing to calculate an approximate trajectory with arbitrary high precision. It was observed that the graph of terms of Taylor's formula has fractal structure. In the present report effectiveness of computational methods will be discussed, some results and open problems will be formulated.

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Baizakov, Asan (Institute of Mathematics, National Academy of Sciences of the Kyrgyz Republic)

On one method of studying the solvability of the Cauchy problem for differential and integro-differential equations with partial derivatives

Abstract: Academician M. Imanaliev and his students laid the foundations for the study of the solvability of the Cauchy problem for some classes of partial differential equations [1]. The essence of this method is the transformation of solutions of the original Cauchy problem to finding solutions of the Volterra integral equation of the second kind equivalent to it, to which the principle of squeezed mappings is applicable. Later, this method of reducing to the nonlinear Volterra integral equation of the second kind was called the method of transformation of solutions in the theory of differential and integral equations [2]. It is noteworthy that the integral representation of the sought-after solutions of the Cauchy problem of nonlinear partial

differential equations is simultaneously found [3-4].

The relevance of the work is due to the need to find solvability conditions for the Cauchy problem for nonlinear partial differential and integro-differential equations.

Objective: to establish the solvability of the solution of the Cauchy problem for nonlinear partial differential equations.

Research methods: a solution transformation method in the analytical and asymptotic theory of differential and integral equations.

Results: we investigated the solvability of the Cauchy problem for nonlinear partial differential and integro-differential equations and found an integral representation of such solutions.

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Durdiev, Durdimurod (Bukhara State University, Uzbekistan)

Problem of determining a multidimensional thermal memory in a heat conductivity equation

Abstract: The multidimensional integro-differential equation of heat conductivity with the time-convolution integral on the right side is considered. The direct problem is represented by Cauchy problem of determining the temperature of the medium at the known initial distribution of heat. For the direct problem it is studied the inverse problem consisting in finding of a time and spatial dependent kernel of the integrated member on known in a hyperplane $x_n =$ for $t > 0$ to the solution of direct problem. With use of the resolvent of kernel this problem is reduced to the investigation of more convenient inverse problem. The last problem is replaced with the equivalent system of the integral equations with respect to unknown functions and on the bases of contractive mapping it is proved unique solvability to the direct and inverse problems.

Hu, Wengui (Sichuan University, China)

Non-emptiness problem and spatial entropy of multi-dimensional shifts of finite type

Abstract: Non-emptiness problem and spatial entropy are important research topics in sym-

bolic dynamical systems. This talk concerns on multi-dimensional shifts of finite type (SFTs). For one-dimensional SFTs, the results are well-known and complete. However, for multi-dimensional SFTs, the problems are more difficult essentially. I will present our recent results about these two topics.

Iskhokov, Sulaimon (Institute of Mathematics, Tajik Academy of Science)

Variational Dirichlet problems for some classes of degenerate elliptic operators

Abstract: The talk is concerned with an application of the theory of weighted function spaces to investigation of variational problems for degenerate partial differential operators. We begin by introducing some results of S. M. Nikol'skii, P. I. Lizorkin, N. V. Miroshin on degenerate partial differential operators given on bounded domain of n-dimensional euclidian space R^n. Then we present our results on an analogue of the Garding's inequality for degenerate elliptic operators in an arbitrary (bounded or unbounded) domain of R^n.

Let Ω be an arbitrary (bounded or unbounded) domain of R^n. We let $d(x)$ denote the distance from a point $x \in \Omega$ to the boundary $\partial\Omega$ if $\partial\Omega \neq \emptyset$. In the case $\Omega = R^n$, let $d(x) = \left(1 + |x|^2\right)^{1/2}$. Suppose that $\sigma(x)$, $\delta(x)$ are positive functions from the class $C^1(\Omega)$ satisfying the conditions $\delta(x) \leq \varkappa d(x), \quad |\nabla\delta(x)| \leq \varkappa, \quad |\nabla\sigma(x)| \leq \varkappa\sigma(x)\delta^{-1}(x)$ for all $x \in \Omega$.

Let r be a natural number. We present a weighted Garding's inequality for differential operator

$$(Lu) = \sum_{|k|,|l|\leq r} (-1)^{|l|}\left(a_{kl}(x)\sigma^2(x)\delta^{-2r+|k|+|l|}(x)u^{(k)}(x)\right)^{(l)}. \tag{1}$$

Let $W_2^r(\Omega;\, \sigma, \delta)$ be a space of all measurable in Ω complex valued functions $u(x)$, which norm defined by equality

$$\|u;\, W_2^r(\Omega;\, \sigma, \delta)\|^2 = \sum_{|k|=r} \int_\Omega \sigma^2(x) \left|u^{(k)}(x)\right|^2 dx + \int_\Omega \sigma^2(x)\delta^{-2r}(x)|u(x)|^2 dx.$$

and let $(W_2^r(\Omega;\, \sigma,\, \delta))'$ be a space of antilinear continuous functionals defined on the space $W_2^r(\Omega;\, \sigma,\, \delta)$. We denote by $B[u,\, v]$ sesquilinear form generated by operator (1). Applying the weighted Garding's inequality we study solvability of the following variational problem:

Problem D_λ. For a given functional $F \in (W_2^r(\Omega;\, \sigma,\, \delta))'$ it is required to fined a solution $U(x) \in W_2^r(\Omega;\, \sigma,\, \delta)$ of the equation

$$B[U,\, v] + \lambda \int_\Omega \sigma^2(x)\delta^{-2r}(x)U(x)\overline{v(x)}dx = \langle F,\, v\rangle \quad (\forall v \in C_0^\infty(\Omega))\,.$$

Coefficients $a_{kl}(x)$ belong to some weighted L_p–spaces.

The next part of our talk is devoted to investigation of solvability of variational Dirichlet problem for higher-order degenerate elliptic operators in the whole space. The sesquilinear forms corresponding to operators under consideration, in general, do not satisfy the coercivity condition.

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Kuchakshoev, Kholiknazar (University of Central Asia, Tajikistan)

On Some Analytical Solutions of Keller-Segel Model

Abstract: We consider analytical solutions for the simple chemotaxis model known as the Keller-Segel model [1]. For $x \in \mathbb{R}^n, n \leq 2$, we obtained bounded travelling wave-type solutions. For the N-dimensional case ($N > 1$) we found two automodelling solutions: blow-up in-time and global in-time [2].

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Lakaev, Saidakhmat (Samarkand State University & Uzbekistan Academy of Sciences)

Bound states in a system of three particles in an optical lattice. The Efimov effect and related results

Abstract: We prove the existence of two and three-particle bound states of for the two and three particle Schrödinger operators $h_\mu(k), k \in \mathbb{T}^d$ and $H_\mu(K), K \in \mathbb{T}^d, d = 1, 2, 3$, associated to Hamiltonians h_μ and H_μ of a system of the two end three identical particles(bosons) on the lattice $\mathbb{Z}^d, d = 1, 2, 3$ interacting via pairwise zero-range attractive $\mu < 0$ or repulsive $\mu > 0$ potentials $\mu \neq 0$. We conclude that these results for a three bosonic system theoretically predicts the existence stable attractively or repulsively bound (composite) objects of three atoms. Hopefully, this can be experimentally confirmed as it done for atoms pair with repulsive interaction in *K. Winkler et al. ...: Repulsively bound atom pairs in an optical lattice.* **Nature, 441***, 853–856 (2006).*

Li, Dingshi (Southwest Jiaotong University, China)

Random attractors for fractional stochastic reaction-diffusion equations on $\mathbb{R}^n$

Abstract: In this talk, we investigate the regularity of random attractors for the non-autonomous non-local fractional stochastic reaction-diffusion equations in $H^s(\mathbb{R}^n)$ with $s \in (0,1)$. We prove the existence and uniqueness of the tempered random attractor that is compact in $H^s(\mathbb{R}^n)$ and attracts all tempered random subsets of $L^2(\mathbb{R}^n)$ with respect to the norm of $H^s(\mathbb{R}^n)$. The main difficulty is to show the pullback asymptotic compactness of solutions in $H^s(\mathbb{R}^n)$ due to the noncompactness of Sobolev embeddings on unbounded domains and the almost sure non-differentiability of the sample paths of the Wiener process. We establish such compactness by the ideas of uniform tail-estimates and the spectral decomposition of solutions in bounded domains. This lecture is based on a joint work with Anhui Gu, Bixiang Wang and Han Yang.

Liu, Jianjun (Sichuan University, China)

TBA

Abstract:

Wang, Xiaohu (Sichuan University, China)

Wong-Zakai approximations and pathwise dynamics of stochastic differential equations

Abstract: In this talk, we will focus on the Wong-Zakai approximations and pathwise dynamics of stochastic differential equations. The white noise can be approximated by stationary process such as Euler approximation of Brownian motion or colored noise.

Yang, Lei (Sichuan University, China)

TBA

Abstract:

Yan, Jingzhi (Sichuan University, China)

TBA

Abstract:

Zhu, Changrong (Chongqing University, China)

Homoclinic and quasiperiodic solutions for ordinary differential equations

Abstract: In this paper we investigate bifurcations of a degenerate homoclinic loop in $\mathbb{R}^N$. We prove that a homoclinic finger-ring, an invariant manifold of a definite dimension textured with homoclinic orbits, arises from the degenerate homoclinic orbit. The size of the homoclinic finger-ring is decided by not only its dimension of manifold but also its width. For the rise of

homoclinic finger-rings of different dimensions we give conditions, which are proved to form bifurcation manifolds in the parameter space. We further estimate the width for the homoclinic finger-ring and give a method to compute the bifurcation manifolds approximately.

Session 3. Complex Analysis, Geometry and Topology

Session 3: Complex Analysis, Geometry and Topology (Venue: Teng Yun Hall, 6th Floor)					
Time	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-09:50	Opening	Sun, Shanzhong		Li, Binru	Free discussion
10:00-10:50	Plenary talks	Usmanov, Zafar		Karimov, Umed	
11:10-12:00		Chen, Youming		Zhou, Jiazu	
12:00	Lunch				
14:30-15:20	Chekeev, Asylbek	Gao, Yan	Free discussion	Plenary talks	Free discussion
15:30-16:20	Sheng, Li	Sadullaev, Azimbay			
16:40-17:30	Zaitov, Adibek	Du, Chengyong			
17:40-18:30	Abdullayev, Fahreddin	Bellitir, Houda		Closing	
18:30	Banquet	Dinner			

Abdullayev, Fahreddin (Kyrgyz-Turkey Manas University, Kyrgyzstan & Mersin University, Turkey)

Approximation properties of some extreme polynomials in a complex plane

Abstract: Let $\mathbb{C}$ be a complex plane, $\overline{\mathbb{C}} = \mathbb{C} \cup \{\infty\}$ and let $G \subset \mathbb{C}$ be a finite Jordan region with $0 \in G$; $L := \partial G$, $\Omega := \overline{\mathbb{C}} \backslash \overline{G}$. Let $w{=}\varphi(z)$ be the conformal mapping of G onto the disk $B(0, \rho_0) := \{w : |w| < \rho_0\}$ normalized by $\varphi(0) = 0$, $\varphi'(0) = 1$

We denote by $A(\overline{G})$ the class of analytic in G and continuous on $\overline{G}$ functions $g(z)$ with the norm

$$\|g\|_{C(\overline{G})} := \max\left\{|g(z)|\,,\ \ z \in \overline{G}\right\}.$$

For any $p > 0$ we define:

$$A_p^1(G) \ \ := \left\{ f \in A(G),\ f(0) = 0,\ f'(0) = 1, \iint\limits_G |f'(z)|^p \, d\sigma_z < \infty \right\},$$

$$\|f\|_p \ \ := \|f\|_{A_p^1(G)} := \left(\iint\limits_G |f'(z)|^p \, d\sigma_z \right)^{\frac{1}{p}},$$

where $d\sigma_z$ denotes two dimensional Lebesque measure. Clearly, $\|\cdot\|_p$ is the quasinorm (i.e. a norm for $1 \le p \le \infty$ and a $p-$norm for $0 < p < 1$).

Let us denote by $\wp_n$ the class of all polynomials $P_n(z)$, $\deg P_n(z) \le n$, satisfying the conditions: $P_n(0) = 0$, $P_n'(0) = 1$.

We consider the following extremal problem:

$$\left\{ \|\varphi - P_n\|_p\,,\ P_n \in \wp_n \right\} \to \inf,\ \ p > 0. \tag{2}$$

According to [1, p.142], it can be seen that, for any $p > 0$, there exists a polynomial $P^*_{n,p} \in \wp_n$ solving the problem (2), and if $p > 1$, this polynomial $P^*_{n,p}(z)$ is unique [1, p. 142]. This unique solution $P^*_{n,p}(z)$ was denoted by $B_{n,p}(z)$ and called $p-$Bieberbach polynomial for the pair $(G, 0)$.

Let

$$\begin{aligned} E_n(g) &: = E_n(g, \overline{G}) := \inf_{P_n \in \wp_n} \|g - P_n\|_{C(\overline{G})} \\ &= \inf_{P_n \in \wp_n} \max_{z \in \overline{G}} |g(z) - P_n(z)|, \\ E_{n,p}(f) &: = E_{n,p}(f, A^1_p(G)) := \inf_{P_n \in \wp_n} \|f - P_n\|_p, \end{aligned}$$

denote the best approximation of $g\ (z)\ \in A(\overline{G})$ and $f \in A^1_p(G)$ by polynomials $P_n(z) \in \wp_n$ in the $C-$norm and A^1_p-norm, respectively.

In this work, we consider analogous problem for the function $\varphi(z)$. For this purpose first, we will obtain estimate of the type

$$E_{n,p}(\varphi) = \|\varphi - B_{n,p}\|_{A^1_p(G)} \leq O(\epsilon_{n,p}),$$

where $\epsilon_{n,p} = \epsilon_{n,p}(\varphi, G) \to 0,\ n \to \infty$ and, secondly, we will obtain estimate of the type of

$$E_n(\varphi) := \inf_{P_n \in \wp_n} \max_{z \in \overline{G}} |\varphi(z) - P_n(z)| \leq O(\eta_{n,p}),$$

where $\eta_{n,p} = \eta_{n,p}(\varphi, G) \to 0,\ n \to \infty$. We estimate also how fast $\epsilon_{n,p} = \epsilon_{n,p}(\varphi, G)$ and $\eta_{n,p} = \eta_{n,p}(\varphi, G)$ tend to zero as $n \to \infty$, depending on the geometric properties of the given region.

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Bellitir, Houda (Sichuan University, China)

The h-$\partial\bar{\partial}$-property of compact complex manifolds

Abstract: I will talk about the adiabatic limit construction of the differential operator d_h introduced by Dan Popovici, for any real non-zero constant h, and introduce the h-$\partial\bar{\partial}$-property of compact complex manifolds that we called h-$\partial\bar{\partial}$-manifolds as well as introduce the d_h-analogues of the standard Bott-Chern and Aeppli cohomologies. In the end, I will proof the stability under small deformations of the h-$\partial\bar{\partial}$-property.

Chekeev, Asylbek (Balasagyn Kyrgyz National University, Kyrgyzstan)

WS-compactification and inversion-closed algebra of a uniform space

Abstract: A compact cX is densely containing Tychonoff space X is called a compactification of X. O.Frink [1] established by means of Wallman–Shanin (WS-) method [2] compactifications

of Tychonoff space. She stated the problem: Can any compactification of Tychonoff space be constructed by means of WS-method? In 25 years Uljanov gave a negative answer to this problem [3].

For any Tychonoff space X and a normal base $\mathcal{F}$ [1] on X denote as $\omega(X,\mathcal{F})$ the WS-compactification [1]. For any compactification cX denote as $\mathcal{A}$ a set of all continuous functions on X continuously extended on cX. Then $\mathcal{F}=\{f^{-1}(0):f\in\mathcal{A}\}$ forms a normal base of X and Wallman compactification $\omega(X,\mathcal{F})$ does not coincide with cX. If $cX=\omega(X,\mathcal{F})$ then compactification cX is called β-like compactification [4]. For any uniform space uX denote as $U(uX)$ the set of all uniformly continuous functions on uX. Then $\mathcal{Z}_u=\{f^{-1}(0):f\in U(uX)\}$ forms a normal base of uX and Wallman compactification $\omega(X,\mathcal{Z}_u)=\beta_uX$ of a uniform space uX is β-like compactification [5].

In this talk the basic properties of β_uX are established and it is shown its interrelation with inversion-closed algebra $C(uX)$ ($C^*(uX)$) of all (bounded) coz-functions on a uniform space uX [5,6].

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Chen, Youming (Chongqing University of Technology, China)

L_∞-algebra structure on dg-manifolds

Abstract: Recently, Mehta, Stiénon and Xu introduced the notion of Atiyah class of a dg-vector bundle and proved that for a dg-manifold $(\mathcal{M},Q)$, there exists an L_∞-algebra structure on $\Gamma(T\mathcal{M})[-1]$ whose first bracket is the Lie derivative of Q, second bracket is the Atiyah cocycle. In this talk, we reformulate this L_∞-algebra structure by Kapranov's formula. Moreover, we construct a new L_∞-algebra structure on $\Gamma(T\mathcal{M})[-1]$ under the Richardson-Nijenhuis bracket who has the same first and second bracket with the previous one and prove that these two L_∞-algebras are isomorphic to $(\Gamma(T\mathcal{M})[-1],\mathcal{L}_Q)$.

Du, Chengyong (Sichuan Normal University, China)

Uniruleness of symplectic birational geometry on orbifolds

Abstract: Hu-Li-Ruan showed that the uniruleness is a symplectic birational invariant for smooth manifolds. Be precise, they defined uniruleness by testing the vanishingness of certain type of Gromov-Witten invariants and showed that such vanishing property is preserved by blow-ups and blow-downs. In this talk, we will explain that such results may be generalized to the orbifold case. We show that the similar vanishing property is preserved by any weighted blow-ups and blow-downs. This is based on the joint work with Bohui Chen and Jianxun Hu.

Gao, Yan (Sichuan University, China)

Entropy theory of rational maps

Abstract: We will introduce the recent progress on core entropy theory developed by W. Thurston. In particular, we focus on the continuity of the entropy function on the polynomial family and Newtonian family.

Karimov, Umed (Institute of Mathematics, Tajik Academy of Science)

On noncontractible Peano continua, all homotopy groups of which are trivial

Abstract: The classical result is that any polyhedron, all homotopy groups of which are trivial, is contractible space, i.e. has homotopy type of point. The Warsawian circle is noncontractible space with trivial homotopy groups, but this space is not locally connected. In the paper [1] simple noncontractible locally connected continuum X all Hawaiian groups and therefore all homotopy groups of which are trivial has been presented without proof. The purpose of the report is to present the proof of noncontractibility of the space X and to show why all homotopy groups of X are trivial.

The existence of noncontractible one point compactification of polyhedron with trivial homotopy groups, but with complicated construction, basing on inverse Kahn spectra, has been proved in [2]. We would like to attract attention to the following open problem.

Problem. Is every locally connected finite dimensional compactum with trivial homotopy groups a contractible space?

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Li, Binru (Fudan University, China)

TBA

Abstract:

Sadullaev, Azimbay (National University of Uzbekistan)

Oscillatory integrals and Weierstrass polynomials

Abstract: The well-known Weierstrass theorem states that if $f(z,w)$ is holomorphic at a point $\left(z^0,w^0\right) \in \mathbb{C}_z^n \times \mathbb{C}_w$ and $f\left(z^0,w^0\right) = 0$, but $f\left(z^0,w\right) \not\equiv 0$, then in some neighborhood $U = V \times W$ of this point f is represented as

$$f(z,w) = \left[\left(w-w^0\right)^m + c_{m-1}(z)\left(w-w^0\right)^{m-1} + ... + c_0(z)\right]\varphi(z,w), \quad (1)$$

where $c_k(z)$ are holomorphic in V and $\varphi(z,w)$ is holomorphic in U, $\varphi(z,w) \neq 0$, $(z,w) \in U$.

In recent years, the Weierstrass representation (1) has found a number of applications in the theory of oscillatory integrals. Using a version of Weierstrass representation the first author (see [1]) obtained a solution of famous Sogge -Stein problem (see [2]). He obtained also close to a sharp bound for maximal operators associated to analytic hypersurfaces.

In the obtained results the phase function is an analytic function at a fixed critical point without requiring the condition $f\left(z^0,w\right) \not\equiv 0$. It is natural to expect the validity of Weierstrass theorem without requiring a condition $f\left(z^0,w\right) \not\equiv 0$, in form

$$f(z,w) = \left[c_m(z)\left(w-w^0\right)^m + c_{m-1}(z)\left(w-w^0\right)^{m-1} + ... + c_0(z)\right]\varphi(z,w). (2)$$

Such kind of results may be useful to studying of the oscillatory integrals and in estimates for maximal operators on a Lebesgue spaces. However, the well-known Osgood counterexample [3], p.90, shows that when $n > 1$ it is not always possible.

In the talk we will discuss, that there is a global option (see [4]), also a global multidimensional (in w) analogue of (2) is true without requiring the condution $f\left(z^0,w\right) \not\equiv 0$. In addition, for an arbitrary germ of a holomorphic function, we will prove one representation, that is useful in the study of oscilatory integrals.

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Sheng, Li (Sichuan University, China)

TBA

Abstract:

Sun, Shanzhong (Capital Normal University, China)

Baker-Campbell-Hausdorff formula revisited

Abstract: Baker-Campbell-Hausdorff (BCH) formula and several variants in Lie theory can be obtained through mould calculus which also gives easily the generalizations. I will give a brief introduction to mould theory and the proofs of BCH formula and some related formulas.

Usmanov, Zafar (Institute of Mathematics, Tajik Academy of Sciences)

Investigation of generalized Cauchy-Riemann systems

Abstract: In the paper developing a theory of generalized Cauchy-Riemann system with polar singularities of order not less than 1 is presented. The special attention is paid to description of formal methods for constructing principally new completely continuous integral operators which state the connection between continuous solutions of a singular system and its simplest representative, so-called a model one. It admits to study different properties of a complicated object through analogical properties of the model singular system. Meanwhile the theory of the last is worked out on the basis of the generalized integral of Cauchy type.

Zaitov, Adibek (Tashkent Institute of Architecture and Civil Engineering, Uzbekistan)

On a metic on the space of monetary risk measures

Abstract: We introduce a metric on the space of monetary risk measure, which generates the point-wise convergence topology and extends the metric on the initial compactum.

Zhou, Jiazu (Southwest University, China)

Isoperimetric problem and L_p dual Minkowski problems in Integral and convex geometry

Abstract: The isoperimetric problem and the Minkowski problem are among the most important problems in Mathematics. Lutwark, Yang and Zhang successfully unified the Minkowski problem and dual Minkowski problem for general surface measures. We will introduce some recent works for (new) (p, q)-affine surface area and (p, q) geominimal surface area and related Minkowski inequalitities and Minkowski problems. This talk includes joint works with N. Fang, S. Feng, X. Li, H. Wang and W. Xu.

Session 4. Probability Theory and Statistics

Session 4: Probability Theory and Statistics (Venue: Qing Yun Hall, 5th Floor)					
Time	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-09:50	Opening	Zhou, Xiaohua		Zhang, Riquan	Free discussion
10:00-10:50	Plenary talks	Mirakhmedov, Sherzad		Iskandar, Sattarov	
11:10-12:00		Ai, Mingyao			
12:00	Lunch				
14:30-15:20	Chen, Songxi	Wang, Qihua	Free discussion	Plenary talks	Free discussion
15:30-16:20	Yang, Xue	Sharipov, Olimjon			
16:40-17:30	Rozikov, Utkir	Wang, Longmin			
17:40-18:30				Closing	
18:30	Banquet	Dinner			

Ai, Mingyao (Peking University, China)

Optimal Distributed Subsampling for Maximum Quasi-Likelihood Estimators with Massive Data

Abstract: Nonuniform subsampling methods are effective to reduce computational burden and maintain estimation efficiency for massive data. Existing methods mostly focus on subsampling with replacement due to its high computational efficiency. If the data volume is too large so that nonuniform subsampling probabilities cannot be calculated all at once, then subsampling with replacement is infeasible to implement. This paper solves this problem by using Poisson subsampling. We first derive optimal Poisson subsampling probabilities in the context of quasi-likelihood estimation under the A- and L-optimality criteria. For a practically implementable algorithm with approximated optimal subsampling probabilities, we establish the consistency and asymptotic normality of the resultant estimators. For the situation that the full data are stored in different blocks or at multiple locations, we develop a distributed subsampling framework, in which statistics are computed simultaneously on smaller partitions of the full data. Asymptotic properties of the resultant aggregated estimator are investigated. The proposed strategies are illustrated and evaluated through numerical experiments on simulated and real data sets.

Chen, Songxi (Peking University, China)

Matrix Completion with Covariate Information

Abstract: This paper investigates the problem of matrix completion from corrupted data, when additional covariates are available. Despite being seldomly considered in the matrix completion literature, these covariates often provide valuable information for completing the unobserved entries of the high-dimensional target matrix A. Given a covariate matrix X with its

rows representing the row covariates of A, we consider a column-space-decomposition model $A = X\beta + B$ where β is a coefficient matrix and B is a low-rank matrix orthogonal to X in terms of column space. This model facilitates a clear separation between the interpretable covariate effects and the flexible hidden factor effects. Besides, our work allows the probabilities of observation to depend on the covariate matrix, and hence a missing-at-random mechanism is permitted. We propose a novel penalized estimator for A by utilizing both Frobenius-norm and nuclear-norm regularizations with an efficient and scalable algorithm. Asymptotic convergence rates of the proposed estimators are studied. The empirical performance of the proposed methodology is illustrated via both numerical experiments and a real data application.

Iskandar, Sattarov (Institute of Mathematics, Uzbekistan Academy of Sciences)

Ergodicity properties of p-adic rational dynamical systems with unique fixed point

Abstract: It is known that analytical functions play an important role in complex analysis. In p-adic analysis, rational functions play a role similar to the role of analytic functions in complex analysis. Therefore, it is important to study the dynamics of these functions in the field of p-adic numbers. Also, these p-adic dynamical systems appear in the study of p-adic Gibbs measures.

In this talk, we discuss a family of $(2, 1)$-rational functions given on the set of p-adic field Q_p. Each such function has a unique fixed point. We characterize ergodicity of each p-adic dynamical system with respect to Haar measure reduced on each invariant sphere. In particular, we describe invariant spheres on which the dynamical system is ergodic and on all other invariant spheres the dynamical systems are not ergodic.

Mirakhmedov, Sherzad (Institute of Mathematics, Uzbekistan Academy of Sciences)

A class of asymptotically efficient estimators based on sample spacings

Abstract: We consider general classes of estimators based on higher-order sample spacings, called the Generalized Spacings Estimators. Such classes of estimators are obtained by minimizing the Csiszar divergence between the empirical and true distributions for various convex functions, include the "maximum spacing estimators" as well as the maximum likelihood estimators (MLEs) as special cases, and are especially useful when the latter do not exist. These results generalize several earlier studies on spacings-based estimation, by utilizing non-overlapping spacings that are of an order which increases with the sample size. These estimators are shown to be consistent as well as asymptotically normal under a fairly general set of regularity conditions. When the step size and the number of spacings grow with the sample size, an asymptotically efficient class of estimators, called the "Minimum Power Divergence Estimators", are shown to exist. Unlike the MLEs, of these estimators are also shown to be quite robust under heavy contamination.

Rozikov, Utkir(Institute of Mathematics, Uzbekistan Academy of Sciences)

Dynamical and Thermodynamical System in Biology

Abstract: We give a preliminaries from biology about free and bisexual populations. Considering several mathematical models of biological dynamical systems we discuss their time and temperature depending behaviors.

Sharipov, Olimjon (National University of Uzbekistan)

Bootstrap for Covariance Operators of Functional Time Series with Applications

Abstract: For testing hypothesis on the covariance operator of functional time series, we suggest to use the full functional information and to avoid dimension reduction techniques. The limit distribution follows from the convergence of the partial sum process in general Hilbert space applied to the product space. In order to obtain critical values for tests, we generalize bootstrap results from the independent to the dependent case. This results can be applied to covariance operators, autocovariance operators and cross covariance operators. We will discuss two sample and change point tests as well.

Wang, Longmin (Nankai University, China)

Branching random walks on hyperbolic groups

Abstract: Let Γ be a nonelementary hyperbolic group equipped with a word metric. Consider a branching random walk (BRW) on Γ with mean offspring $\lambda < \infty$ and let ρ be the spectral radius of the base motion. It is known that, if and only if $\lambda \leq \rho^{-1}$, the BRW is transient in the sense that the population eventually vacates every finite subset of Γ.

We will study the critical behavior for the volume growth rate $\Phi(\lambda)$ of the trace of BRW. More precisely, we prove that the rate $\Phi(\lambda)$ exhibits a phase transition at $\lambda = \rho^{-1}$ and has critical exponent $1/2$ in the sense that $\Phi(\rho^{-1}) - \Phi(\lambda) \sim C \left(\rho^{-1} - \lambda\right)^{1/2}$ as $\lambda \uparrow \rho^{-1}$ for some positive constant C.

This is a joint work with Zhan Shi, Vladas Sidoravicius and Kainan Xiang.

Wang, Qihua (Chinese Academy of Sciences)

Bias-corrected Kullback-Leibler distance criterion based model selection with covariables missing at random

Abstract: Let Y be the response variable, and (X, Z) the covariable vector. We consider the model selection problem for $f_{Y|X,Z}(y|x, z)$ with X missing at random, where $f_{Y|X,Z}(y|x, z)$ is the conditional probability function of Y given (X, Z). Two novel model selection criteria are suggested. One is called bias-corrected Kullback-Leibler distance (BCKL) criterion and another one is called empirical-likelihood-based bias-corrected Kullback-Leibler distance (EL-BCKL) criterion. Both the criteria specify a parametric model, which do not need to be correct, for $f_{X|Y,Z}(x|y, z)$, the conditional probability function of the missing covariates given the observed variables. It is shown, however, that the model selection by both the proposed criteria is consistent and that the population parameter estimators, corresponding to the selected model, are also consistent and asymptotically normal even if the parametric model for $f_{X|Y,Z}(x|y, z)$

is misspecified. This is a remarkable superiority of our proposed criteria to some existing model selection strategies. Extensive simulation studies are conducted to investigate the finite-sample performances of the proposed two criteria and a thorough comparison is made with some related model selection methods. The simulation results show that our proposals perform competitively especially when the conditional distribution of the missing covariates given the observed variables is misspecified. Supplementary materials for this article are available online.

Yang, Xue (Tianjin University, China)

Reflected Backward Stochastic Partial Differential Equations in a Convex Domain

Abstract: This work is concerned with the reflected backward stochastic partial differential equations, taking values in a convex domain in $\mathbb{R}^k$. The existence and uniqueness of solution are studied under both the super-parabolic and parabolic conditions. In the degenerate parabolic case the connection between reflected backward stochastic partial differential equations and reflected forward backward stochastic differential equations is established. This is a joint work with Qi Zhang and Tusheng Zhang.

Zhang, Riquan (East China Normal University, China)

超高维数据特征筛选

Abstract: 本报告将详细介绍近十年超高维筛选的研究成果，包含：参数模型、非参数及半参数模型、无模型假定的超高维筛选，其中: 参数模型下，主要介绍确定性独立筛选方法、一般化的皮尔逊相关系数筛选方法以及广义线性模型下的特征筛选；非参数及半参数模型下，主要介绍可加模型、变系数模型以及部分线性模型下的筛选方法；无模型假定下，主要介绍确定性独立排序筛选方法、距离相关系数筛选方法、分位数自适应筛选方法以及鞅差相关系数筛选方法；最后给出超高维筛选未来待研究的问题以及若干我们自己的工作。

Zhou, Xiaohua (Peking University, China)

Mathematica Foundation of Causal Inference and Its Applications in Biostatistics

Abstract: In this talk, I will introduce concepts, principles and tools that have led to a coherent mathematical theory of causation based on potential outcome framework. The theory provides solutions to a number of problems in causal inference, including questions of non-compliance, truncation by death, confounding control, mediation, and missing data in biomedical research.

Session 5. Applied, Computational, Industrial and Engineering Mathematics

Session 5: Applied, Computational, Industrial and Engineering Mathematics (Venue: Ling Yun Hall, 4th Floor)					
Time	Monday	Tuesday	Wednesday	Thursday	Friday
09:00-09:50	Opening	Zhou, Tao		Zhang, Shiquan	Free discussion
10:00-10:50	Plenary talks	Ashyralyev, Allaberen		Duan, Huoyuan	
11:10-12:00				Tang, Qinglin	
12:00	Lunch				
14:30-15:20	Soleev, Akhmadjon	Chen, Gang	Free discussion	Plenary talks	Free discussion
15:30-16:20	He, Qiaolin	Aripov, Mersaid			
16:40-17:30	Azamov, Abdulla	Wang, Hao			
17:40-18:30	Nie, Yufeng	Gong, Wei		Closing	
18:30	Banquet	Dinner			

Aripov, Mersaid (National University of Uzbekistan)

Mathematical modeling of reaction diffusion processes with variable density

Abstract: The mathematical models generated by modern problems of a science and technique, as a rule are nonlinear. Mathematical models of many physical, chemical, biological and other processes in one and two componential nonlinear media described by nonlinear degenerate type parabolic equation and they systems. Solution of such type equation and system in general is complicated problem. Therefore, mathematical modeling becomes almost unique means for solution nonlinear applied problems. For computational goal before numerical analysis of a solution of nonlinear problem as showed practice important to investigate the qualitative properties of solutions, establishing a condition of arising critical cases, blow up, estimation of solution in different classes, asymptotic of solution, to find an exact solution (if it possible) depending on value of numerical parameters of considered nonlinear problems.

This talk is devoted to mathematical modeling of nonlinear processes of reaction diffusion in one and two componential media described by degenerate type double nonlinear parabolic equation and systems with variable density. As mathematical model, we consider the Cauchy problem. Based on the self-similar and approximately self-similar solutions of the system, at first we study the qualitative properties of solutions reaction-diffusion system with variable density under action of source or absorption. Depending on value of the numerical parameters and initial data using comparison principle, the Fujita type global solvability of solution, the phenomena of a finite speed propagation of solution, a space localization for double nonlinear parabolic equation, their systems with variable density, asymptotes of self-similar solutions and free boundary (front) are established. Fujita type critical exponent, second critical exponent, critical cases are considered. It is shown, that presentation of the equation and system with variable density in the so-called "radial symmetrical" form allow easily construct the Zeldovich-Barenblatt type solution for degenerate type nonlinear equation and coupled system, cross system with variable density, and with a source or an absorption. Results of numerical experiments and visualization

of solution discussed.

Ashyralyev, Allaberen (Institute of Mathematics and Mathematical Modeling, Kazakhstan)

A space-dependent identification problem for telegraph-parabolic equations

Abstract: The theory and applications of various local and nonlocal boundary value problems for mixed type partial differential equations have been investigated by many scientists in (see, e.g., [1]-[3] and the references given therein). In the present paper, a space-dependent identification problem for telegraph-parabolic equations in a Hilbert space with self-adjont operator is studied. The stability estimates for solution of identification problem are established. In applications, stability estimates for the solution of four telegraph-parabolic problems are obtained.

References

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Azamov, Abdulla (Institute of Mathematics, Uzbekistan Academy of Sciences)

Outstanding Lev Plays differential games

Abstract: Lev S. Pontryagin (1908-1988) is famous due to his great contributions to algebraic topology and topological groups, differential equations and optimal control theory. During 24 years he had been studying the theory of Differential Games (briefly DG's)(the first publication [1] and the last one [2]).

Such kind of games are usually given by an equation $\dot{z} = f(z, u, v)$ where u is a control parameter of the 1st player ($\mathcal{P}$) and v is one of 2nd player ($\mathcal{E}$), satisfying constraints $u \in P$, $v \in Q$. Of course the trajectory $z(t)$ depends on how players will control their parameters u, v. In the control theory they are integrable functions $u(t)$, $v(t)$ and therefore it is easy to deal with. Unlike that in differential games a player say $\mathcal{P}$ is to choose his control as a function $u(t, z)$ or $u(t, z, v(t))$ those may be discontinuous or even as a functional $u(t, z_t(\cdot), v_t(\cdot))$ of functions defined in intervals $[0, t]$. As a consequence the theory of DG's meet difficult obstacles among them a problem of existence of trajectories. In many publications the notions "$\mathcal{P}$ wins" and "$\mathcal{Q}$ wins" and their variations are used in the intuitive level.

Under described circumstances L.S.Pontryagin introduced new phenomena called alternating integral

$$W^{\tau}(M) = \int_{0,\,M}^{\tau} e^{tA}P dt \stackrel{*}{-} e^{tA}Q dt$$

that is pure mathematical notion (where M is a terminal set). He proved if the game is linear i.e. $\dot{z} = Az - u + v$ then the condition $z(0) \in W^{\tau}(M)$ is sufficient to win $\mathcal{P}$ on the interval $[0, \tau]$ [3]. In [4] duality of alternating integral was opened. In [5] Pontryagin's alternating integral for

linear inclusions was studied. The present report is devoted to generalization of the alternating integral method to nonlinear DG's [6].

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Chen, Gang (Sichuan University, China)

An HDG Method for Dirichlet Boundary Control of Convection Dominated Diffusion PDES

Abstract: We first propose a hybridizable discontinuous Galerkin (HDG) method to approximate the solution of a convection dominated Dirichlet boundary control problem without constraints. Dirichlet boundary control problems and convection dominated problems are each very challenging numerically due to solutions with low regularity and sharp layers, respectively. Although there are some numerical analysis works in the literature on diffusion dominated convection diffusion Dirichlet boundary control problems, we are not aware of any existing numerical analysis works for convection dominated boundary control problems. Moreover, the existing numerical analysis techniques for convection dominated PDEs are not directly applicable for the Dirichlet boundary control problem because of the low regularity solutions. In this work, we obtain an optimal a priori error estimate for the control under some conditions on the domain and the desired state. We also present some numerical experiments to illustrate the performance of the HDG method for convection dominated Dirichlet boundary control problems.

Duan, Huoyuan (Wuhan University, China)

A finite element method for curlcurl-grad div eigenvalue problem

Abstract: In this talk, I will report a new finite element method for the curlcurl-grad div eigenvalue problem. Such problem typically arises from electromagnetism and fluid-structure interaction. The new method uses Lagrange elements of any order not less than two on the barycenter-based refinements of the meshes. We prove that the new method is spurious-free and spectral-correct and optimally convergent. Numerical results are also presented.

Gong, Wei (Chinese Academy of Sciences)

Approximations of Stokes Dirichlet boundary control problem in energy space

Abstract: In this talk we introduce our recent results on Stokes Dirichlet boundary control problems on polygonal domain. We study the Dirichlet boundary control problems with the energy space method. We show the well-posedness of the formulation and derive the first order optimality conditions. For the approximations we use the Taylor-Hood finite elements, a priori error estimates are proved and some preliminary numerical examples are given.

He, Qiaolin (Sichuan University, Chian)

Energy stable discontinuous Galerkin methods for phase field models of two-phase compressible flows

Abstract: We present a stable discontinuous Galerkin methods for phase field models of two-phase compressible flows which has energy decaying property. Numerical simulations are carried out to verify the stability of the scheme. Numerical results show that the average concentration difference for the two components of the initial state determines the long time behavior of the diffusive interface for the two–phase flow, which are consistent with theoretical asymptotic stability results established by the authors.

Soleev, Akhmadjon (Samarkand State University, Uzbekistan)

Power geometry in solving nonlinear problems

Abstract: Many problems in mathematics, physics, biology, economics and other sciences are reduced to nonlinear equations or to systems of such equations. The equations may be algebraic, ordinary differential or partial differential, and systems may comprise the equations of one type, but may include equations of different types. The solutions of these equations and systems subdivide into regular and singular ones. Near a regular solution the implicit function theorem or its analogs are applicable, which gives a description of all neighboring solutions.

Near a singular solution the implicit function theorem is inapplicable, and until recently there had been no general approach to analysis of solutions neighboring the singular one. Although different methods of such analysis were suggested for some special problems. The purpose of this work is to supply a general purpose set of algorithms for analysis of singularities applicable to all types of equations. Here we present basic ideas and algorithms of Power Geometry and give a survey of some of its applications. Power Geometry gives alternatives to Algebraic Geometry,

Differential Algebra, Micro local Analysis, and so on.

In this talk we intend to give basic notions of Power Geometry, present some of its algorithms, and applications for a polynomial depending on three variables near its singular point, where the polynomial vanishes with all its first partial derivatives. We propose a method of computation of asymptotic expansions of all branches of the set of roots of the polynomial near the mentioned singular point.

Power geometry is based on the construction of Newton polyhedron (its elements, normal cones, etc.) and power transformations.

References

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[3] Soleev A., Soleeva N. Power Geometry for Finding Periodic Solutions in One System of ODE. Malaysian Journal of Mathematical Sciences. No 2, 2014.

Tang, Qinglin (Sichuan University, China)

An efficient numerical method to compute the ground state of rotating dipolar Bose-Einstein Condensates

Abstract: In this talk, we will present an efficient numerical method for computing the ground state of the rotating dipolar Bose-Einstein Condensates (BEC). The method consists two main merits: (i) efficient and accurate numerical methods will be proposed to evaluate the nonlocal dipole-dipole interaction. (ii) a nonlinear conjugate gradient method, accelerated by some well-adapted preconditioners, will be developed to compute the ground states. This work is realized in collaboration with Xavier ANTOINE (IECL, Lorraine, France), Antoine LEVITT (Inria, Paris, France) and Yong ZHANG (Tianjin University, Tianjin, China).

Wang, Hao (Sichuan University, China)

TBA

Abstract:

Zhang, Shiquan (Sichuan University, China)

Model order reduction and its application to the simulation of lithium-ion battery model

Abstract: In this talk, we will introduce the basic idea of model order reduction for the simulation of parameterized PDE. Especially we will discuss several important issue include reduced basis method, POD and empirical interpolation method. Then we will apply this approach to

the simulation of lithium-ion battery model.

Zhou, Tao (Chinese Academy of Sciences)

Energy stability for time fractional phase field equations

Abstract: We shall review recent results on energy stability for time fractional phase field equations. In particular, the maximum principle for the time fractional Allen-Cahn equation and the relevant maximum-principle preserving schemes will also be discussed. We will also present some open questions.

*All talks will take place at Jiu Tian Hotel (成都九天国际大酒店).

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