

 **Mathematical Society of Japan**

2012 AUTUMN MEETING

Titles and Short Summaries of the Talks

September, 2012

at Kyushu University

2012 Mathematical Society of Japan

AUTUMN MEETING

Dates: September 18th–21st, 2012

Venue: Ito Campus, Kyushu University

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Mathematical Society of Japan

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	I Room 2308	II Room 2307	III Room 2306	IV Room 2305	V Room 2304	VI Room 2407	VII Room 2406	VIII Room 2404	IX Room 2403
18th (Tue)	Algebra 9:00–12:00 14:15–16:15	Complex Analysis 10:00–12:00 14:30–16:15	Functional Equations 9:00–12:00 14:15–16:15		Statistics and Probability 9:15–12:00 14:15–14:45	Applied Mathematics 9:30–12:00 14:15–16:40	Infinite Analysis 9:30–11:45 14:15–14:45	Geometry 9:00–12:00 14:15–16:00	Topology 9:15–12:00 14:15–16:00
	Featured Invited Talks					13:00–14:00			
	Invited Talk 16:30–17:30	Invited Talk 16:30–17:30	Invited Talk 16:30–17:30		Invited Talks 15:00–16:00 16:15–17:15	Invited Talk 16:50–17:50	Invited Talk 15:00–16:00	Invited Talk 16:15–17:15	Invited Talk 16:20–17:20
19th (Wed)	Algebra 9:00–12:00	Complex Analysis 10:00–12:00 Invited Talk 13:15–14:15	Functional Equations 9:00–12:00 Invited Talk 13:15–14:15	Functional Analysis 9:45–11:50 Invited Talk 13:00–14:00	Statistics and Probability 9:15–12:00	Applied Mathematics 9:30–12:15	Infinite Analysis 10:30–11:50 Invited Talk 13:30–14:30	Geometry / Topology Invited Talks 10:50–11:50 13:15–14:15	
	MSJ Prizes Presentation (VIII + IX) (14:50–15:20)								
	Plenary Talks (VIII + IX) MSJ Autumn Prize Winner (15:30–16:30)								
	Kengo Hirachi (Univ. of Tokyo) (16:45–17:45)								
	Official Party (Inamori Center, Inamori Hall) (18:00–20:00)								
20th (Thu)	Algebra 10:00–11:30 14:15–16:45	Real Analysis 10:00–11:45 14:15–15:40	Functional Equations 9:00–12:00 14:15–16:15	Functional Analysis 9:30–11:50 14:15–16:30	Statistics and Probability 9:15–12:00	Applied Mathematics 9:30–12:00 Special Session 14:15–16:40	Found. of Math. and History of Math. 9:00–11:20 14:15–17:05	Geometry 9:00–12:00 14:15–16:15	Topology 9:30–11:45 14:15–15:40
	Featured Invited Talks					13:00–14:00			
	Invited Talk 17:00–18:00	Invited Talk 15:50–16:50	Invited Talk 16:30–17:30	Invited Talk 16:30–17:30	Invited Talks 14:30–15:30 15:45–16:45	Invited Talk 16:50–17:50		Invited Talk 16:30–17:30	Invited Talk 16:00–17:00
21st (Fri)	Algebra 9:00–11:00 14:15–15:45	Real Analysis 9:40–12:00 14:15–16:00	Functional Equations 9:00–12:00 14:15–16:30	Functional Analysis 9:30–11:50		Applied Mathematics 9:00–12:00 14:15–16:30	Found. of Math. and History of Math. 9:00–11:40		Topology 9:15–12:00
	Featured Invited Talks					13:00–14:00			
	Invited Talks 11:00–12:00 15:45–16:45	Invited Talk 16:10–17:10	Invited Talk 16:45–17:45	Invited Talk 14:15–15:15		Invited Talk 16:45–17:45	Invited Talk 14:20–15:20		

All the Conference Rooms of the Autumn Meeting are located on the Ito Campus of Kyushu University, in Center Zone Building No. 2.

Plenary Talks

September 19th (Wed) Conference Room VIII + IX

MSJ Autumn Prize Winner (15:30~16:30)

Kengo Hirachi (Univ. of Tokyo)[#] Einstein equations and conformal invariants (16:45~17:45)

Summary: In 1985, Fefferman and Graham introduced a Ricci-flat Lorentz metric of signature $(n + 1, 1)$ associated with a conformal manifold of dimension n , which is now called the ambient metric. The ambient metric is a main tool in recent conformal geometry and has been used to produce many conformal invariant operators and tensors; moreover, the metric has played a central role in the AdS/CFT correspondence in physics. In this talk, I will review the progress of the theory and report some new results (joint work with Robin Graham) on the refinement of the ambient metric with singularities that arises from even-dimensional conformal manifolds.

Featured Invited Talks

September 18th (Tue)

Conference Room IX

Guest Talk from Taiwan Mathematical Society

Chin-Lung Wang (Nat. Taiwan Univ.) Quantum Leray–Hirsch and analytic continuations (13:00~14:00)

Conference Room II

Shinichi Kobayashi (Tohoku Univ.)[#] p -adic approaches to the Birch and Swinnerton–Dyer conjecture (13:00~14:00)

Summary: In this talk, we overview and explain recent progresses in the Birch and Swinnerton–Dyer conjecture (the BSD conjecture) and its p -adic analogue. The BSD conjecture says that the rank of the Mordell–Weil group (the group of rational points) of elliptic curve E defined over the rational numbers is equal to the order of the Hasse–Weil L -function of E at $s = 1$. There is also a stronger version of the BSD conjecture (the full BSD conjecture) which describes the leading term of the L -function at $s = 1$ in terms of arithmetic invariants such as the order of the Tate–Shafarevich group. The first general result for the BSD conjecture is obtained by J. Coates and A. Wiles in 1976 where p -adic methods were introduced. Since then, p -adic methods become a standard approach to the BSD conjecture, and a p -adic analogue of the BSD conjecture is also formulated. There was a significant progress in the p -adic BSD conjecture by K. Kato in the middle 90th by proving a half the Iwasawa main conjecture of elliptic curves. Namely, the Mordell–Weil rank is bounded by the order of the p -adic L -function of E at $s = 1$. Recently, C. Skinner and E. Urban announced a proof of another half of the Iwasawa main conjecture under certain assumptions, and obtained an application for the full BSD conjecture when the analytic rank of E is zero. A priori, there is no logical reason to believe a link between the BSD conjecture and the p -adic analogue except when the rank is zero. However, the Gross–Zagier formula and its p -adic analogue relate these when the rank is 1. By these formulas, we can prove the derivatives of the (complex) Hasse–Weil L -function and the p -adic L -function are essentially equal. Recently, the speaker proved the p -adic Gross–Zagier formula at supersingular primes and obtained the expected application for the full BSD conjecture when the rank is 1.

September 20th (Thu)

Conference Room IX

Kaoru Ono (Kyoto Univ.)* Spectral invariants for Hamiltonian diffeomorphisms and their applications (13:00~14:00)

Summary: For a periodic Hamiltonian system, its periodic orbits are considered as critical points of the action functional associated to the Hamiltonian system, which is defined on a suitable covering space of the loop space. Roughly speaking, Floer complex is an analog of Morse–Novikov complex for the action functional. Spectral invariants are defined as min-max type critical values of the action functional (Viterbo, Oh, Schwarz, etc.). Some years ago, Entov and Polterovich used them to construct what they call Calabi quasi-morphisms on (a certain covering group of) the group of Hamiltonian diffeomorphisms under certain assumption on symplectic manifolds and partial symplectic quasi-states on the space of continuous functions. Their theory provides very nice application for non-displaceability questions (a subset is called displaceable if it can be disjointed from itself by a Hamiltonian diffeomorphism). Based on a joint work with Fukaya, Oh and Ohta, I would like to explain how their criterion is related to Lagrangian Floer theory, especially in the case of Lagrangian tori in compact toric manifolds.

Conference Room II

Kenjiro Yanagi (Yamaguchi Univ.)# Progress of quantum information theory —From classical information to quantum information— (13:00~14:00)

Summary: In this talk we will review on classical or quantum information sciences. In classical case we give probability measures on Banach spaces and define information channels with input/output spaces which are represented by Banach spaces. And we obtain some results of capacity of discrete time Gaussian channels with feedback and state several conjectures. In quantum case we state capacity of classical-quantum channels which was given by Holevo. We also introduce quantum teleportation and other topics in quantum mechanics. At last we give the recent results related to skew informations which are the extensions of Heisenberg or Schrodinger’s uncertainty relations.

Conference Room VI

Hisashi Inaba (Univ. of Tokyo)[#] Mathematics of the basic reproduction number R_0 —Chasing a key parameter of population dynamics— (13:00~14:00)

Summary: The concept of the basic reproduction number, denoted by R_0 , is a most important idea in structured population dynamics, epidemiology and demography. In epidemiology, R_0 is defined as the average number of secondary cases produced by a typical primary case during its entire course of infection, while, in demography, it is the average number of female children produced per a woman during her entire life, which mean that R_0 is the asymptotic per generation growth factor (*generational interpretation*). The invasion threshold principle can be formulated as a *sign relation* such that the Malthusian parameter is positive if $R_0 > 1$, while it is negative if $R_0 < 1$. During the last two decades, this naive concept has been successfully developed into a dominant idea to understand complex population dynamics. From practical point of view, a remarkable point is that the Malthusian parameter of the population is connected with R_0 through the characteristic equation, so the total population growth can be controlled by changing the parameters at individual level from which we can calculate R_0 .

In this research, we introduce a new definition of R_0 in *time-heterogeneous* environments based on a new integral operator, called the *generation evolution operator* (GEO), acting on the extended state space, which has a clear, realistic biological meaning. Using the GEO, we have shown that the definition of R_0 in a constant environment by Diekmann, Heesterbeek and Metz (1990) and the definition of R_0 for a periodic environment by Bacaër and Guernaoui (2006) completely allow the generational interpretation, and they are calculated as the spectral radius of GEO. That is, the new definition is a unique extension of those existing definitions. Although R_0 by our definition is acting as a threshold value for population growth in any time-heterogeneous environment, it is not yet clear what is a most universal environment such that our R_0 satisfies the sign relation and the generational interpretation.

September 21st (Fri)

Conference Room VI

Yuji Tachikawa (Univ. of Tokyo)[#] Mathematics and supersymmetric quantum field theory . . . (13:00~14:00)

Summary: The study of supersymmetric quantum field theory has been a source of new mathematical ideas and conjectures. The most notable examples among them would be the mirror symmetry relating symplectic geometry and complex geometry, and the study of four-manifolds by the monopole equation. One of the objectives of the talk is to outline how these mathematical ideas are extracted from the properties of supersymmetric quantum field theories, and to describe some other interesting but not as well-known conjectures thus extracted.

For this purpose, I will try to explain how physicists operate on supersymmetric quantum field theories, in a way hopefully understandable to mathematicians: I will describe a supersymmetric quantum field theory as a mathematical ‘object’ belonging to a ‘category’ \mathcal{S} of supersymmetric quantum field theories. The category \mathcal{S} has not at all been mathematically well-formulated yet, but the point is that physicists know tentative definitions and heuristics to avoid contradictions so that they can work without much problem on a day-to-day basis. The situation might be comparable to that of analysts before ϵ - δ .

There are various ‘functors’ from this yet-to-be-defined ‘category’ \mathcal{S} to mathematically already-defined categories. Then a ‘known’ relation in the ‘category’ \mathcal{S} is mapped to many relations in mathematically already-defined categories, thus giving rise to various mathematical conjectures.

Conference Room VII

Yuichi Komori (Chiba Univ.)* Small talks on mathematical logic for mathematician (13:00~14:00)

Summary: I shall give four small talks on Mathematical logic. The first of them is on electromagnetism. It shows the gap between a qualitative explanation and a quantitative analysis. The second is on the elimination of function symbols and Axiom of Choice. It shows the gap between Axioms and Axiom Schemes. The third is on Godel's first incompleteness theorem and Kleene's result(1952). We need to understand the concept of 'recursive' or 'recursively enumerable' to grasp the incompleteness. But by Kleene's result, 'finite axiomatizable' can replace 'recursively axiomatizable'. The fourth is on the foundation of mathematics by the lambda-calculus. It reminds us a philosophical and mathematical query "what is the identity?".

Foundation of Mathematics and History of Mathematics

September 20th (Thu) Conference Room VII

9:00–11:20

- 1 Shigeru Masuda (Kyoto Univ.)[#] Traditional diversion of real to imaginary since Euler, and innovative strictness by Poisson’s sense 20

Summary: Fourier consults Descartes and improves the method of distinction between real and imaginary, and how to get the number of roots in an interval. On the other hand, Poisson [5, 6] refers the diversion from algebraic to transcendental to Euler [1] and Laplace [3, 4], and asserts the direct and strict method of integral instead of diversion. Fourier published his heat theory including diffusion [2] in 1822, Poisson also proposes his theories of heat distribution. Poisson disputes with Fourier over the diversion from algebraic into transcendental to solve the differential equations. The sense what do bring up the differences of these method are to calculate the differential or integral for Fourier, and to solve differential or integral equation for Poisson, which comes from, we think, traditional sense and innovative sense for learning.

- 2 Shigeru Masuda (Kyoto Univ.)[#] Proofs and applications relating to describability of an arbitrary function by trigonometric series in the 19C 20

Summary: Lagrange and Fourier propose the trigonometric series. The poor and inexact provings by the progenitors of this theory, of convergence of the series, motivates Poisson [5] and Cauchy [1]. As the contemporary, immediately applying to the wave equations or etc., Both acknowledge their own provings as defect after trials. Before and after Fourier’s death, Dirichlet [2] and Riemann [6] try to prove the describability of the arbitrary function with trigonometric series by Fourier. In 1888, R. Fujisawa [4] also tries the proving of it. Of the arbitrary function using the series developed by trigonometrics, on the one hand, Dirichlet discusses ‘die Darstellung’ (‘the description’), on the other, both Riemann and Fujisawa entitle ‘die Darstellbarkeit’ (‘the describability’).

- 3 Teruaki Asai (Nara Univ. of Edu.)* On the $2/n$ table of the Rhind Mathematical Papyrus 10

Summary: Rhind Mathematical Papyrus contains a table of $2/n$ expressed as a sum of unit fractions for odd integers $3 < n \leq 101$. I want to show how the table has been created.

- 4 Shunji Horiguchi [#] The surveyings of Gonemon Higuchi and his pupils 15
(Niigata Sangyo Univ.)

Summary: Gonemon Higuchi (1601–1683) is the founder of west surveyings in Japan. We investigate the Portugal surveying and the Netherlands one of Higuchi and pupils, synthetically.

- 5 Shunji Horiguchi [#] The mariner’s compass of Seizaemon Kanazawa and that of Yoemon Shizuno 15
(Niigata Sangyo Univ.)

Summary: Seizaemon Kanazawa (1625–1684) invented the mariner’s compass in which east and west were shown conversely. Yoemon Shizuno made the mariner’s compass with precise reverse east and west after that. He surveyed the tunnel of the Minamizawa canal pit of the Sado gold-and-silver mountain perfectly using this. We consider how the Kanazawa’s compass got across to Shizuno through the geographical surveyors of mathematics developed in Japan.

6 Hideyuki Majima (Ochanomizu Univ.)[‡] On the determinat by SEKI Takakazu in “Sangaku-genkun” 30

Summary: SEKI Takakazu is a Japanese mathematician in an early period of the Edo era, known as the first person to study the so-called “resultant” and “determinant” in the world. These works are found in “Kai-hukudai-no-ho” and “Taisei-sankei”. Recently, we found different versions of “Kai-hukudai-no-ho”, called “Sangaku-genkunn”. From those documents, we can follow the process of his discovery of “determinant”.

14:15–17:05

7 Tsukane Ogawa (Yokkaichi Univ.)[‡] Geometry studied in the Shisei-Sanka School 25

Summary: I will analyze the structure of plane or solid geometric problems and their solutions collected in the Kioushu, the annual report of the Shisei-Sanka School, which was published from 1808 to 1828. This time the first report published in 1808 will be investigated and the complexities of the solutions be measured in particular.

8 Shotaro Tanaka * Representation of fractional function in power series —De Moivre, L. Euler, G. H. Hardy, Y. Wada, M. Fujiwara— 20

Summary: L. Euler expanded $(1 - z)/(1 - z - 2z^2)$ in an ascending power series $1 + 0z + 2z^2 + \dots$. Y. Wada found the following relations: $1/(1 - x)^{p+1} = \sum d_p(K)x^{k-1}(|x| < 1)$; $1/(x - 1)^{p+1} = \sum d_p(K)x^{-p-k}(|x| > 1)$. M. Fujiwara expanded $(x - 1)/(2x^2 - 3x + 1)$ in decending one $(1/2)x^{-1} + (5/4)x^{-2} + \dots$. We state, for example, $(1 - z)/(1 - z - 2z^2) = (2/3) \sum (-1)^{k-1} z^{-k} + (-1/3) \sum 2^{-k} z^{-k} (1 < |z|)$; $0(z = 1)$; $(2/3) \sum (-x)^{k-1} + (-1/3) \sum 2^{-k} z^{-k} (1/2 < |z| < 1)$; $3/2(z = -1/2)$; $(2/3) \sum (-z)^{k-1} + (1/3) \sum (2z)^{-k} (|z| < 1/2)$.

9 Toshimichi Usuba (Nagoya Univ.)[‡] Large cardinals and indestructibly Lindelöf spaces 15

Summary: A Lindelöf space X is said to be indestructible if every σ -closed forcing notion preserves the Lindelöf property of X . M. Scheepers and F. D. Tall showed that under a certain large cardinal assumption, the statement that “there is no indestructibly Lindelöf spaces of pseudocharacter ω and size $> \omega_1$ ” is consistent. We show that the statement “there is no indestructibly Lindelöf T_3 spaces of weight $\leq \omega_1$ and size $> \omega_1$ ” is equiconsistent with the existence of an inaccessible cardinal.

10 Takahiro Seki (Niigata Univ.)[‡] On relations among double negation translations in substructural logics 15

Summary: It is well known that classical predicate logic can be interpreted in intuitionistic predicate logic by using double negation translations. In this talk, we consider relations among double negation translations such as Kuroda’s negative translation, Kolmogorov’s negative translation, and Gödel–Gentzen negative translation in substructural logics which are neither commutative nor associative. To prove equivalence among double negation translations, double negation shift-like axioms for conjunction, implications, and fusion play an important role.

- 11 Takayuki Kihara (JAIST)[#] Strong measure zero sets in computability theory I —Lightface Π_1^0 sets
 Kojiro Higuchi (Tohoku Univ.) and the perfect set property— 15

Summary: The strongly measure zero sets of reals have been widely studied in the context of set theory of the real line. We introduce an effectivization of strong nullness. A set of reals is said to be *effectively strongly null* if, for any computable sequence of positive rationals $\{\varepsilon_n\}$, a sequence of intervals I_n of diameter ε_n covers the set. We show that, for Π_1^0 subsets of Cantor space, effective strong nullness is equivalent to the property that fails to have a computably perfect subset. We also investigate the Muchnik degrees of effectively strongly null Π_1^0 classes.

- 12 Takayuki Kihara (JAIST)[#] Strong measure zero sets in computability theory II —Kolmogorov
 Kenshi Miyabe (Kyoto Univ.) complexity and triviality— 20

Summary: For Π_1^0 sets of reals, the effective strong nullness is turned out to be equivalent to being measure zero with respect to any computably represented atomless outer measure. Then, there are several candidates for a definition of *effectively strongly null reals*. Given randomness notion \mathcal{R} , a real is said to be *strongly \mathcal{R} -null* if it is contained in an \mathcal{R} -test with respect to any computably represented atomless outer measure. We characterize the notion of strongly \mathcal{R} -nullness in the context of initial segment Kolmogorov complexity such as *complex*, *totally complex*, *anticomplex*, and *Schnorr trivial*. In addition, we will present a construction of a Schnorr trivial real which computes a Schnorr random real with tiny use, and an anticomplex Schnorr random real.

- 13 Toshio Suzuki (Tokyo Metro. Univ.)[#] The eigen distribution of an AND-OR tree under directional algorithms
 Ryota Nakamura (Tokyo Metro. Univ.) 15

Summary: Liu and Tanaka (2007) characterize the probability distribution achieving the equilibrium of an AND-OR tree. We show that the uniqueness of such a distribution fails, provided that we restrict ourselves to directional algorithms (algorithms whose priority of probing leaves does not depend on the history). We also show a weak version of the Liu–Tanaka result for directional algorithms. Our main method is No-free-lunch theorem (Wolpert and MacReady, 1995: Averaged over all cost-functions, all search algorithms have the same performance).

- 14 Toshio Suzuki (Tokyo Metro. Univ.)[#] Resource-bounded randomness and computable Dowd-type generic sets
 Masahiro Kumabe 15
 (Open Univ. of Japan)

Summary: Ambos-Spies et al. introduced the concept of resource-bounded random sets by extending the works of Schnorr and Lutz. Their concept of generic sets is based on time-bound of finite-extension strategy. In contrast, the concept of Dowd-type generic sets is based on an analogy of forcing theorem. And, the relationship between resource-bounded randomness and Dowd-type genericity has been not clear so far. We show that there exists a primitive recursive function $t(n)$ such that every $t(n)$ -random set is r -generic in the sense of Dowd for each positive integer r .

September 21st (Fri) Conference Room VII

9:00–11:40

- 15 Yoshihiro Abe (Kanagawa Univ.)[#] Restricted structural properties of ideals on $\mathcal{P}_\kappa\lambda$ and weak normality 15

Summary: The function on κ regular maps any bounded set to bounded set. This is not the case for $\mathcal{P}_\kappa\lambda$, which makes difficult to build a nice structural theories of ideals on $\mathcal{P}_\kappa\lambda$. When only the functions mapping bounded sets to bounded sets are considered, the sup function and weak normality by Mignon plays an important role.

- 16 Tatsuya Shimura (Nihon Univ.)[#] Admissible rules for one variable formulas and disjunction property · · 15

Summary: $N_i(p)$ denotes the Nishimura’s i -th one variable formula. Sasaki found a proof-theoretic proof of a strong form of disjunction property for the set of one variable formulas $\{N_{4n+2} \mid n \geq 2\}$. This can be proved as an application of a strengthened Scott–Lemmon’s admissible rule: $\vdash \Gamma \rightarrow N_8(A)$ implies $\vdash \Gamma \rightarrow N_5(A)$ for appropriate formulas Γ . We show the same holds for $\{N_{4n} \mid n \geq 3\}$ as an application of the rule: $\vdash \Gamma \rightarrow N_{10}(A)$ implies $\vdash \Gamma \rightarrow N_7(A)$.

- 17 Katsumi Sasaki (Nanzan Univ.)[#] The exact model constructed from normal forms in normal modal logics containing **K4** 10

Summary: In 2010, we constructed normal forms and the exact model for the set **F** of formulas with finite propositional variables p_1, \dots, p_m in the modal logic **S4**; and provided a detailed description of the mutual relation of formulas in **F** in **S4**. The construction of normal forms can be naturally extended into the normal modal logics containing **K4**. The construction of the exact model can also be extended, but the Kripke model obtained by this construction is not generally exact. Here, we prove the equivalence between the following two conditions:

- (1) the resulting Kripke model is exact,
- (2) there exists an exact model.

- 18 Keita Yokoyama (Tokyo Tech)[#] Ramsey’s theorem without Σ_1 -induction 10

Summary: Determining the strength of Ramsey’s theorem RT_k^n is one of the crucial topics in the study of second-order arithmetic. In this talk, I will show that Ramsey’s theorem does not imply Σ_1 -induction over RCA_0^* . Here, RCA_0^* is a system weaker than RCA_0 , which consists of Σ_0^0 -induction, recursive comprehension and the totality of exponentiation.

- 19 Keita Yokoyama (Tokyo Tech)[#] Some versions of Friedman’s self-embedding theorem 10

Summary: In this talk, I will give some versions of Friedman’s self-embedding theorem, which can characterize subsystems of PA.

- 20 Keita Yokoyama (Tokyo Tech)[#] A generalization of Schnorr’s theorem 10

Summary: In this talk, I will generalize the definition of partially random or complex reals, and then give a generalized version of Schnorr’s theorem.

- 21 Kenji Fukuzaki (Int. Univ. of Kagoshima) * Definability of the ring of integers in some infinite algebraic extensions of the rationals 15

Summary: Let K be an infinite Galois extension of the rationals such that every finite subextension has odd degree over the rationals and its prime ideals dividing 2 are unramified. We show that its ring of integers is first-order definable in K . As an application we prove that $\mathbf{Q}(\{\cos(2\pi/l^n) : l \in \Delta, n \in \mathbf{N}\})$ together with all its Galois subextensions are undecidable, where Δ is the set of all the prime integers which are congruent to -1 modulo 4.

- 22 Yoshihito Tanaka (Kyushu Sangyo Univ.) # Conservativity of Boolean algebras with operators over semilattices with operators 15
 Agi Kurucz (King’s Coll. London)
 Frank Wolter (Univ. of Liverpool)
 Michael Zakharyashev (Birkbeck Coll. London)

Summary: The description logic \mathcal{EL} is a logical base of large scale ontologies in medicine and other life science. As the language of \mathcal{EL} consists of propositional variables, the constants \top , \perp , conjunction and diamonds, its natural algebraic semantics is *bounded meet-semilattices with monotone operators* (SLOs, for short). This presentation is our initial results in an attempt to clarify which equational theories of SLOs are complete with respect to the relational semantics and which are not. We also prove that the *completeness problem*—given a finitely axiomatised equational theory of SLOs, decide whether it is complete with respect to the relational semantics—is algorithmically undecidable, which establishes a principle limitation regarding possible answers to our research question.

- 23 Hiroaki Minami (Univ. Nacional Autónoma de México) # Mathias–Prikry forcing and dominating reals 15
 Michael Hrušák

Summary: We give a combinatorial characterization of those filters for which the Mathias–Prikry forcing does not add any dominating reals.

- 24 Hirotaka Kikyo (Kobe Univ.) # On small superstable generic structures 15

Summary: A conjecture of Baldwin states that if the theory of an ab initio generic structure is superstable then it is ω -stable. Ikeda gave a counter example to this conjecture as a binary graph for the case with coefficient 1. Ikeda and the speaker gave counter examples to the case with rational coefficients less than 1. The theories of examples are not small. Baldwin asked if the conjecture is true if you assume that the theory of the generic structure is small. We will discuss about this conjecture.

14:20–15:20 Talk invited by Section on Foundation and History of MathematicsKenshi Miyabe (Kyoto Univ.)[#] Natural properties that a randomness notion should have

Summary: Martin-Löf (1966) proposed a randomness notion that is called Martin-Löf randomness now. Schnorr (1971) didn't agree with this definition and proposed another randomness notion that is called Schnorr randomness now. Subsequently many properties are proved on Martin-Löf randomness that a randomness notion should have such as universality, characterization by complexity and van Lambalgen's Theorem. Then Martin-Löf randomness has been regarded as the most natural randomness notion.

It is after 2000 that many natural properties are proved on Schnorr randomness. Although Schnorr randomness does not have universality, it is quite doubtful to say that Martin-Löf randomness is more natural than Schnorr randomness.

In this talk I introduced some properties of Martin-Löf randomness and Schnorr randomness, which include my recent results on Schnorr randomness. Then I claim that Schnorr randomness is much more natural randomness notion especially in studying the relation with computable analysis.

Algebra

September 18th (Tue) Conference Room I

9:00–12:00

- 1 Yukio Ohkubo ‡ Distribution of the first digits of prime numbers 10
 (Int. Univ. of Kagoshima)

Summary: It is known that the increasing sequence of all prime numbers (p_n) does not obey Benford law (abbreviated B.L.) in every base $b \geq 2$. We showed that the sequence (p_n) obeys almost g_α -B.L. for each $0 \leq \alpha \leq 1$, where $g_\alpha(x) = \frac{x}{(b-1)\alpha+1} + \frac{(b-1)\min(x,\alpha)}{(b-1)\alpha+1}$ for $0 \leq x \leq 1$.

- 2 Yoshifumi Tsuchimoto (Kochi Univ.)* On splitting behaviors of polynomials at primes 15
 Hajime Kuroiwa (Kochi Univ.)
 Tatsuya Itagaki (Kochi Univ.)
 Yuusuke Watou (Kochi Univ.)

Summary: Let u be a monic irreducible polynomial with integral coefficients. Then we may discuss its splitting behaviours over finite fields \mathbb{F}_p . We defined a set of entire functions $\{f_i\}$ such that $f_i(p) = 0$ for all i if and only if u splits completely over \mathbb{F}_p . Likeise we may also obtain a set of entire functions on p which describes the congruent Zeta function of f modulo p . An application of our theory to dynamical systems such as $z \mapsto z^2 + 1$ is discussed.

- 3 Kenichi Shimizu * Prime values of quadratic polynomials and imaginary quadratic fields 10

Summary: In 1912, Frobenius and Rabinowitsch showed that the equivalence between prime-producing polynomials and imaginary quadratic fields with class numbers one. We generalize their results to imaginary quadratic fields with exponents two.

- 4 Soichi Ikeda (Nagoya Univ.)* On transcendental numbers generated by certain integer sequences ... 10
 Kaneaki Matsuoka (Nagoya Univ.)

Summary: By generalizing Dresden’s technique, we prove a theorem which gives us a sufficient condition for the transcendence of the numbers generated by certain integer sequences. In addition, we consider the numbers generated by the last non-zero digits of $n^n, n^{n^n}, n^{n^{n^n}}$, etc. and the number of trailing zeros of n^j ($j \in \mathbb{N}$ and $10 \nmid j$) as the examples.

- 5 Kazuhito Kozuka * Knopp type identities for generalized multiple Dedekind type sums attached to matrices and Dirichlet characters 10
 (Miyakonojo Nat. Coll. of Tech.)

Summary: For classical Dedekind sums, it is known that Knopp’s identity and Subrahmanyam’s one are equivalent. Generalizations of this for generalized Dedekind sums are studied by many mathematicians. In this talk, for matrices of which the components are rational integers and for Dirichlet characters, we define generalized multiple Dedekind type sums and show generalizations of Knopp’s identity, Subrahmanyam’s identity and their equivalence.

- 6 Yoshinori Hamahata [#] Continued fractions and Dedekind sums for function fields 10
 (Ritsumeikan Univ.)

Summary: For the classical Dedekind sum $d(a, c)$, H. Rademacher and E. Grosswald raised the following two questions:

1. Is $\{(a/c, d(a, c)) | a/c \in \mathbb{Q}^*\}$ dense in \mathbb{R}^2 ?
2. Is $\{d(a, c) | a/c \in \mathbb{Q}^*\}$ dense in \mathbb{R} ?

Using the theory of continued fractions, D. Hickerson solved these questions affirmatively. In function fields, we have a Dedekind sum $s(a, c)$ which is similar to $d(a, c)$. Using continued fractions in function fields, we solve the analogous problems for $s(a, c)$.

- 7 Masanori Katsurada (Keio Univ.)[#] Shintani zeta-functions of several variables and Lauricella hypergeometric functions II 10

Summary: The main object of this talk is the double Shintani zeta-function of n complex variables $\mathbf{s} = (s_1, \dots, s_n)$, defined with n complex parameters $\mathbf{z} = (z_1, \dots, z_n)$ satisfying $|\arg z_j| < \pi$ ($j = 1, \dots, n$). We shall present its complete asymptotic expansions as z_j 's ($j = 1, \dots, n$) tend to 0 or ∞ , each through a certain complex poly-sector. Applications of these asymptotic expansions will further be given.

- 8 Tomoya Machide (Kinki Univ.)[#] On a parameterized sum formula for triple zeta values 10

Summary: A typical formula of multiple zeta values is the sum formula which expresses a Riemann zeta value as a sum of all multiple zeta values of fixed weight and depth. Recently weighted sum formulas, which are weighted analogues of the sum formula, have been studied. In this talk, we give a parameterized sum formula for triple zeta values, which is a generalization of the weighted sum formula.

- 9 Tomoya Machide (Kinki Univ.)[#] On a relation between multiple zeta values and the gamma function 10

Summary: It is known that there is a relation between multiple zeta values and the gamma function, more precisely, a two variable function whose coefficients are some multiple zeta values can be written in terms of the gamma function. In this talk, by the use of the above fact, we give a new relation between multiple zeta values and the gamma function. As a corollary, we obtain some formulas for multiple zeta values.

- 10 Yoshio Tanigawa (Nagoya Univ.)^{*} On relations among Dirichlet and multiple L -values mod 4 10
 Jun Furuya
 (Okinawa Nat. Coll. of Tech.)
 Makoto Minamide
 (Kyoto Sangyo Univ.)

Summary: Recently multiple zeta values are studied extensively. Here we are concerned with the various relations between multiple L and Dirichlet L -values mod 4. Especially we shall give the interesting relations between multiple L -values of depth 2 and Dirichlet L -values.

- 11 Ick Sun Eum (KAIST)[#] Some applications of modular units 15
 Ja Kyung Koo (KAIST)
 Dong Hwa Shin
 (Hankuk Univ. of Foreign Studies)

Summary: We show that a weakly holomorphic modular function can be expressed as a sum of modular units of higher level. We further find a necessary and sufficient condition for a meromorphic Siegel modular function of degree 2 restricted to certain subset of the Siegel upper half-space \mathbb{H}_2 to have neither zero nor pole.

- 12 Yuichi Sakai (Kyushu Univ.)^{*} The Ramanujan–Serre differential operators and certain elliptic curves
 Masanobu Kaneko (Kyushu Univ.) 10

Summary: For several congruence subgroups of low levels and their conjugates, we derive differential equations satisfied by the Eisenstein series of weight 4 and relate them to elliptic curves, whose associated new forms of weight 2 constitute the list of Martin and Ono of new forms given by eta-products/quotients.

- 13 Tomoyoshi Ibukiyama (Osaka Univ.)[#] A lift to vector valued Siegel modular forms of half integral weight and Shimura type conjecture revisited 10

Summary: (1) A Yoshida type lifting to vector valued Siegel modular forms of half integral weight from a pair of elliptic modular forms is constructed.
 (2) We show that the difference of dimensions between Haupt type and Neben type vector valued Siegel modular forms of half integral weight is exactly the dimension of those pair of elliptic curves.
 (3) We give a Haupt type version of my previous conjecture (which is on Neben type) on Shimura type correspondence between Siegel modular forms of half integral weight and integral weight. (This direction of study on Haupt type was suggested to me by N. Dummigan in private email this March.)
 (4) Explicit structures of Jacobi forms are also mentioned.

- 14 Toshiyuki Kikuta (Osaka Inst. of Tech.)^{*} On Ramanujan type congruences for modular forms with several variables 10
 Shoyu Nagaoka (Kinki Univ.)

Summary: We give congruences between the Eisenstein series and a cusp form in the cases of Siegel modular forms and Hermitian modular forms. We should emphasize that there is a relation between the existence of a prime dividing the $k - 1$ -th generalized Bernoulli number and the existence of non-trivial Hermitian cusp forms of weight k . We will conclude by giving numerical examples for each case.

- 15 Shoyu Nagaoka (Kinki Univ.)^{*} On p -adic properties of Siegel modular forms 10
 Siegfried Böcherer
 (Univ. Mannheim/Univ. of Tokyo)

Summary: We show that Siegel modular forms of level $\Gamma_0(p^m)$ are p -adic modular forms. Moreover we show that derivatives of such Siegel modular forms are p -adic. Parts of our results are also valid for vector-valued modular forms. In our approach to p -adic Siegel modular forms we follow Serre closely; his proofs however do not generalize to the Siegel case or need some modifications.

14:15–16:15

- 16 Daisuke Shiomi (Tokyo Univ. of Sci.)* On the Hasse–Witt invariants of the maximal real subfields of cyclotomic function fields 10

Summary: In the previous meeting, we talked about some results for the Hasse–Witt invariants of cyclotomic function fields. In this talk, we consider the maximal real subfields of cyclotomic function fields. The main result of this talk is to give an explicit formula of the Hasse–Witt invariants of the maximal real subfields of cyclotomic function fields.

- 17 Hizuru Yamagishi (Tokyo Denki Univ.)# On hyperelliptic curves of Chebyshev type 15

Summary: Let $K = \mathbf{C}(t)$ and let $f(t) = t - 1/t$, $g(t) = t + 1/t$. Let E be the elliptic curve defined by the equation $y^2 = f(x)$. Let C_f (resp. C_g, C_{fg}) be the hyperelliptic curve defined by $u^2 = f(t^3)$ (resp. $u^2 = g(t^3)$, $u^2 = f(t^3)g(t^3)$). Let E_f (resp. E_g, E_{fg}) be the twist of E by the extension $K(C_f)/K(\mathbf{P}^1)$ (resp. $K(C_g)/K(\mathbf{P}^1)$, $K(C_{fg})/K(\mathbf{P}^1)$) of degree 2. Then we obtain that $\text{rank}(E_f(K)), \text{rank}(E_g(K)), \text{rank}(E_{fg}(K)) \geq 3$.

- 18 Shinnya Okumura (Kyushu Univ.)# On the number of \mathbb{F}_p -valued points of elliptic curves 15

Summary: Let E be an elliptic curve defined by a Weierstrass equation with integer coefficients and let $E(\mathbb{F}_p)$ be the group of \mathbb{F}_p -valued points of $E \bmod p$ where p is a prime number such that E has good reduction at p . Let a, b, t be positive integers. Koblitz conjectured the number of primes $p \leq x$ such that E has good reduction at p and $|E(\mathbb{F}_p)|$ is a prime. This conjecture is refined by Zywna.

We consider how the probability that $|E(\mathbb{F}_p)|/t$ is prime varies with a if we impose the congruence condition $p \equiv a \pmod{b}$ with $\text{gcd}(a, b) = 1$. In this talk we present our conjecture and its background. We give also some examples which support our conjecture.

- 19 Yuki Kato (Tohoku Gakuin Univ.)* The isomorphism between motivic cohomology and K -groups for equi-characteristic regular local rings 10

Summary: One of the well-known problems in the algebraic K -theory is the comparison of higher Chow groups and K -groups. In this talk, using the motivic complex defined by Voevodsky–Suslin–Friedlander, we prove the comparison theorem for equi-characteristic regular local rings.

- 20 Yoshiyasu Ozeki (Kyoto Univ.)# Full faithfulness theorem for torsion crystalline representations 10

Summary: Mark Kisin proved that a certain restriction functor on crystalline p -adic representations is fully faithful. In this talk, we prove the torsion analogue of Kisin’s theorem.

- 21 Manabu Yoshida (Kyushu Univ.)# A refinement of the local class field theory of Serre and Hazewinkel 10

Summary: We give a refinement of the local class field theory of Serre and Hazewinkel. This refinement allows the theory to treat extensions that are not necessarily totally ramified.

- 22 Yuto Takahashi (Nagoya Univ.)[#] Infiniteness of class field towers degrees of extensions of which are restricted to products of 2 and 3 10

Summary: The objective of this study is to investigate the difference between class field towers and p -class field towers in their infiniteness. In order to achieve this purpose, we refine class field towers. When P is a set of prime numbers, we define the “ P -restricted class field tower”, restricting degrees of extensions to products of elements of P . Conventional class field towers and p -class field towers can be regarded as special cases of P -restricted class field towers. In this talk, we show that there exist certain infinite families of quadratic fields with infinite $\{2, 3\}$ -restricted class field towers.

- 23 Mitsul Tohkailin (Kinki Univ.)[#] A characterization of some number fields of infinite degree using absolute Galois groups 15
Manabu Ozaki (Waseda Univ.)

Summary: Neukirch–Uchida gave a certain characterization of number fields of finite degree using absolute Galois groups. In this article, we give a new characterization of some number fields of infinite degree using absolute Galois groups.

- 24 Teruhisa Kadokami[#] Iwasawa invariants of cyclic branched covers of links 10
(East China Norm. Univ.)
Yasushi Mizusawa
(Nagoya Inst. of Tech.)

Summary: Based on the analogy between knots and primes, J. Hillman, D. Matei and M. Morishita defined the Iwasawa invariants for sequences of cyclic branched covers of links with an analogue of Iwasawa’s class number formula of number fields. We consider mainly the existence of covers of links with prescribed Iwasawa invariants, discussing some analogies in number theory. If time permits, we would like to propose a problem analogous to generalized Greenberg’s conjecture.

16:30–17:30 Talk invited by Algebra Section

- Yoichi Mieda (Kyoto Univ.)[#] Toward generalization of the non-abelian Lubin–Tate theory

Summary: The local Langlands correspondence for GL_n over a p -adic field F , due to Harris–Taylor and Henniart, gives relationship between (possibly infinite-dimensional) irreducible representations of $GL_n(F)$ and n -dimensional ℓ -adic Galois representations of F . This correspondence can be constructed geometrically. Actually, it appears in the ℓ -adic étale cohomology of a tower of the universal deformation space of a fixed formal \mathcal{O}_F -module of height n . This fact is called the non-abelian Lubin–Tate theory, since it is a natural generalization of the classical Lubin–Tate theory which gives an explicit description of the local class field theory (= the local Langlands correspondence for GL_1) for F by using formal \mathcal{O}_F -modules of height 1. The tower mentioned above is called the Lubin–Tate tower.

The local Langlands correspondence is expected for general reductive algebraic groups over F , and proved in some cases. In this talk, I would like to explain my attempt to generalize the non-abelian Lubin–Tate theory to other groups than $GL_n(F)$. The Lubin–Tate tower is replaced by a Rapoport–Zink tower, which is a tower of certain moduli spaces of p -divisible groups with additional structures. In the case of smaller groups, we obtain several analogous results. We also find some interesting phenomena which do not appear in the original GL_n -case.

9:00–12:00

- 25 Akinari Hoshi (Rikkyo Univ.)[#] Noether’s problem and unramified Brauer groups 10
 Ming-chang Kang (Nat. Taiwan Univ.)
 Boris E. Kunyavskii (Bar-Ilan Univ.)

Summary: Let k be any field, G be a finite group acting on the rational function field $k(x_g : g \in G)$ by $h \cdot x_g = x_{hg}$ for any $h, g \in G$. Define $k(G) = k(x_g : g \in G)^G$. Noether’s problem asks whether $k(G)$ is rational (= purely transcendental) over k . It is known that, if $\mathbb{C}(G)$ is rational over \mathbb{C} , then $B_0(G) = 0$ where $B_0(G)$ is the unramified Brauer group of $\mathbb{C}(G)$ over \mathbb{C} . Bogomolov showed that, if G is a p -group of order p^5 , then $B_0(G) = 0$. This result was disproved by Moravec for $p = 3, 5, 7$ by computer calculations. We will prove the following theorem. Theorem. Let p be any odd prime number, G be a group of order p^5 . Then $B_0(G) \neq 0$ if and only if G belongs to the isoclinism family Φ_{10} in R. James’s classification of groups of order p^5 .

- 26 Aiichi Yamasaki (Kyoto Univ.)[#] Table of conjugacy classes of finite groups in $GL(5, \mathbb{Z})$, $GL(6, \mathbb{Z})$ and some calculations on elliptic curves 10

Summary: There are 710 conjugacy classes of finite groups in $GL(4, \mathbb{Z})$, and there is a famous table H. Brown, R. Bulow, J. Neubuser, H. Wondratschek, H. Zassenhaus, “Crystallographic groups of four-dimensional space”, but for $GL(5, \mathbb{Z})$ and $GL(6, \mathbb{Z})$, there seemed to be no such table. I made a list of conjugacy classes of finite groups in $GL(5, \mathbb{Z})$, $GL(6, \mathbb{Z})$ based on Carat 2.1b1 by J. Opgenorth, W. Plesken, T. Schulz. I also made a computer program for some calculations on elliptic curves.

- 27 Akinari Hoshi (Rikkyo Univ.) Rationality problem for algebraic tori 10
 Aiichi Yamasaki (Kyoto Univ.)

Summary: We give a birational classification of algebraic tori of dimension 4 and 5 over an arbitrary field k except for the remaining two cases in dimension 5.

- 28 Yasushi Gomi (Sophia Univ.)[#] q -analogue of Gauss sums on the symmetric groups 10

Summary: As a generalization of the classical Gauss sum, a Gauss sum on a finite group is defined. Gomi–Meda–Shinoda determined the values for complex reflection groups $G(m, r, n)$. I define a q -analogue of Gauss sums on the symmetric groups and determine their values. Also I determine the values of the trace functions of the Iwahori–Hecke algebras of type A , which are corresponding to the given q -analogue of Gauss sums of the symmetric groups.

- 29 Tomoyuki Arakawa (Kyoto Univ.)[#] Zhu’s algebra and C_2 -algebra of parafermion vertex operator algebras
 Ching Hung Lam (Academia Sinica) 15
 Hiromichi Yamada (Hitotsubashi Univ.)

Summary: We study Zhu’s algebra and C_2 -algebra of parafermion vertex operator algebras associated with the affine Kac–Moody Lie algebra \widehat{sl}_2 . It is shown that they have the same dimension and Zhu’s algebra is semisimple. The classification of irreducible modules is also established. Moreover, we obtain the C_2 -cofiniteness of the parafermion vertex operator algebras for all finite dimensional simple Lie algebras.

30 Kenichi Shimizu (Nagoya Univ.)[#] Real representations of Hopf $*$ -algebras 20

Summary: We introduce the notion of real, complex and quaternionic representations of a Hopf $*$ -algebra and prove the following alternative form of the theorem of Linchenko and Montgomery: Let V be an irreducible $*$ -representation of a semisimple Hopf $*$ -algebra with character χ . The Frobenius–Schur indicator $\nu(\chi)$ is equal to $+1$, 0 or -1 according to that V is real, complex, or quaternionic.

31 Masao Kiyota (Tokyo Med. Dent. Univ.)^{*} The heights of irreducible Brauer characters in 2-blocks of the symmetric
Tetsuro Okuyama groups 15
(Hokkaido Univ. of Edu.)

Tomoyuki Wada
(Tokyo Univ. of Agri. and Tech.)

Summary: There exists a unique irreducible Brauer character of height zero in any 2-block of the symmetric group. This generalizes the theorem of Fong and James that the dimension of every non-trivial 2-modular simple module of the symmetric group is even.

32 Seok-Jin Kang (Seoul Nat. Univ.)[#] Geometric realization of Khovanov–Lauda–Rouquier algebras associ-
Masaki Kashiwara ated with Borcherds–Cartan data 15
(Kyoto Univ./Seoul Nat. Univ.)

Euiyong Park (Seoul Nat. Univ.)

Summary: We construct a geometric realization of the Khovanov–Lauda–Rouquier algebra associated with a symmetric Borcherds–Cartan matrix $A = (a_{ij})_{i,j \in I}$ via quiver varieties. As an application, if a_{ii} are nonzero for all i , we prove that there exists a 1-1 correspondence between Kashiwara’s lower global basis (or Lusztig’s canonical basis) and the set of isomorphism classes of indecomposable projective graded modules. This result is posted on arXiv:1202.1622.

33 Myungho Kim (KIAS)[#] Khovanov–Lauda–Rouquier algebras and R-matrices 15
Seok-Jin Kang (Seoul Nat. Univ.)

Masaki Kashiwara
(Kyoto Univ./Seoul Nat. Univ.)

Summary: For a family of good modules $\{V_s\}_{s \in S}$ over a quantum affine algebra $U'_q(\widehat{\mathfrak{g}})$, we define an action of a Khovanov–Lauda–Rouquier algebra $R(n)$ on a localization of the tensor products of the affinizations $V_{s,\text{aff}}$. Using this action, we define a functor from the category of finite dimensional $R(n)$ -modules to the category of finite dimensional $U'_q(\widehat{\mathfrak{g}})$ -modules. We investigate some applications of this functor which are useful for studying the structures of the Grothendieck rings.

34 Masahide Konishi (Nagoya Univ.)[#] Level 1 cyclotomic KLR algebras of cyclic quivers 10

Summary: A Khovanov–Lauda–Rouquier algebra is defined by a quiver Γ and weight α on Γ_0 . We can define a cyclotomic ideal using another weight Λ on Γ_0 . And we get a cyclotomic KLR algebra as a quotient of a KLR algebra by the cyclotomic ideal. Cyclotomic KLR algebras have finite dimension and it’s hard to determine exact dimension of these in general. We fix Γ cyclic quiver which has n vertices, α has weight 1 for all vertices, and Λ has weight 1 only for one vertex and otherwise 0. Then we can obtain the complete set of primitive idempotents, how much blackballs are needed to vanish them, and systematic changes of structures for n by using diagrammatic approach.

35 Sei-Qwon Oh (Chungnam Nat. Univ.)[‡] Poisson brackets and Poisson spectra in polynomial algebras 15

Summary: Poisson brackets on the polynomial algebra $C[x, y, z]$ are studied. A description of all such brackets is given and, for a significant class of Poisson brackets, the Poisson prime ideals and Poisson primitive ideals are determined. The results are illustrated by numerous examples.

September 20th (Thu) Conference Room I

10:00–11:30

36 Manabu Matsuoka * Polynomial realization of sequential codes 10
(Kuwana-Kita High School)

Summary: In this talk we study the relation between polycyclic codes and sequential codes over finite fields. It is shown that, for a sequential code C , C is realized as an ideal in the quotient ring of the polynomial ring. Furthermore, we characterize the dual codes of polycyclic codes.

37 Yasuyuki Hirano [‡] On rings with primitive idempotents 10
(Naruto Univ. of Edu.)

Summary: We consider rings R with primitive idempotents. We show that some properties of primitive idempotents of R characterize the structure of R . In particular, we show that if 1 is a sum of primitive orthogonal idempotents and if the set M consisting of 0 and all primitive idempotents in R is closed under multiplication, then R is the direct sum of subrings with no non-trivial idempotents.

38 Satoshi Yamanaka (Okayama Univ.)[‡] On Galois polynomials of degree p in skew polynomial rings of derivation
Shûichi Ikehata (Okayama Univ.) type 10

Summary: Let B be a ring of prime characteristic p , and D a derivation of B . Let $B[X; D]$ be a skew polynomial ring in which the multiplication is given by $\alpha X = X\alpha + D(\alpha)$ ($\alpha \in B$). Let $f = X^p - Xa - b$ be a polynomial in $B[X; D]$ such that $fB[X; D] = B[X; D]f$. We shall give a necessary and sufficient condition for f to be a Galois polynomial in $B[X; D]$. This is a generalization of T. Nagahara's theorem.

39 Akira Ueda (Shimane Univ.) * Skew Rees rings which are maximal orders 10
Monika Rianti Helmi (Andalas Univ.)
Hidetoshi Marubayashi
(Tokushima Bunri Univ.)

Summary: Let R be a Noetherian prime ring, σ be an automorphism of R and X be an invertible ideal of R . We define the $(\sigma; X)$ -maximal order and show that a skew Rees ring $R[Xt; \sigma]$ is a maximal order if and only if R is a $(\sigma; X)$ -maximal order, which is proved by using the complete description of divisorial ideals of $R[Xt; \sigma]$.

40 Takao Sumiyama (Aichi Inst. of Tech.) On Szele matrices of finite rings 10

Summary: A finite ring is an associative ring consisting of only finitely many elements. Structure of finite rings are determined by structure constants called Szele matrices. In this talk, we discuss algorithms to determine whether two finite rings are isomorphic or not.

- 41 Tsunekazu Nishinaka [#] On primitivity of group rings of one-relator groups 10
 (Okayama Shoka Univ.)

Summary: Let R be a ring with the identity element. Then R is right primitive if and only if there exists a faithful irreducible right R -module M_R . If a group is finite or abelian, then the group ring of such groups can never be primitive. The first non-trivial example of primitive group ring was offered in 1972. After that, many examples which include the result for primitivity of group rings of free products of non-trivial groups (except $Z_2 * Z_2$) settled by Formanek were constructed. On the other hand, we do not know whether group rings of many important groups are primitive or not. The present author has recently given the primitivity of group rings of HNN extensions of free groups and the primitivity of group rings of locally free groups.

In this talk, we introduce primitivity of group rings of one-relator groups with torsion.

- 42 Kazutoshi Koike [#] Morita duality and finite ring extensions 10
 (Okinawa Nat. Coll. of Tech.)

Summary: It is known that if a ring A is Morita dual to a ring B and R is a finite normalizing (triangular) extension of A , then R is Morita dual to some ring extension of B . However the form of S was not known. Concerning the result, in this talk, we shall present the result that the ring S is a finite ring extension of B and if B is basic then S is a finite normalizing (triangular) extension of B .

- 43 Hiroaki Komatsu ^{*} A characterization of separable algebras by generalized derivations ... 10
 (Okayama Pref. Univ.)

Summary: Let A and B be rings, and let M and N be (A, B) -bimodules. An additive mapping $f : M \rightarrow N$ is called a *generalized derivation* if f satisfies $f(amb) = f(am)b + af(mb) - af(m)b$ for all $m \in M$, $a \in A$, and $b \in B$. Given an (A, A) -bimodule W , an additive mapping $f : A \rightarrow W$ is a derivation if and only if f is a generalized derivation and $f(1) = 0$. We show that an algebra A over a commutative ring R is separable if and only if, for any ring B and for any (A, B) -bimodules M and N , every generalized derivation from M to N which is an R -homomorphism is a sum of an A -homomorphism and a B -homomorphism.

14:15–16:45

- 44 Ryo Akiyama (Shizuoka Univ.)[#] 3-iterated quadratic Ore extensions 10

Summary: Classification of AS-regular algebras is one of the major projects in noncommutative algebraic geometry. In fact, the geometric classification of 3-dimensional AS-regular algebras due to Artin, Tate and Van den Bergh was the starting point of this field. Iterated quadratic Ore extensions in the title are known as examples of quadratic AS-regular algebras. In this talk, we will try to answer the question which 3-dimensional quadratic AS-regular algebras are 3-iterated quadratic Ore extensions of k . We will classify 3-iterated quadratic Ore extensions of k by using geometric techniques due to Artin, Tate and Van den Bergh.

- 45 Kenta Ueyama (Shizuoka Univ.)[#] Fixed subalgebras of AS-regular algebras under finite cyclic group actions 15

Summary: Group actions (or Hopf algebra actions) on noncommutative algebras are the main theme in noncommutative invariant theory. In this talk, we will study fixed subalgebras of AS-regular algebras under finite cyclic group actions. AS-regular algebras are the main object of study in noncommutative algebraic geometry. They are the noncommutative analogues of the polynomial algebra. Suppose that a finite cyclic group G naturally acts on a certain AS-regular algebra A . We will show that under some mild conditions, the endomorphism algebra of A over A^G is isomorphic to the skew group algebra $A * G$ as graded algebras. Moreover, we will also show the existence of a cluster tilting module over A^G .

- 46 Yasuhiko Takehana[#] A generalization of stable torsion theory 10
(Hakodate Nat. Coll. of Tech.)

Summary: P. Gabriel and E. P. Armendariz characterized a stable torsion theory for a hereditary torsion theory. Let s be a left exact radical. For a torsion theory (T, F) , if T is closed under taking s -injective hulls, we call (T, F) be a s -stable torsion theory. In this talk we characterize s -stable torsion theories and give some related facts.

- 47 Hideto Asashiba (Shizuoka Univ.)[#] Derived equivalence classification of generalized multifold extensions of
Mayumi Kimura (Shizuoka Univ.) piecewise hereditary algebras of tree type 10

Summary: Let \mathbb{k} be an algebraically closed field. All algebras are assumed to be basic finite-dimensional \mathbb{k} -algebras. An algebra A is called piecewise hereditary of tree type if it is derived equivalent to a hereditary algebra whose quiver is an oriented tree. A generalized multifold extension of A is a \mathbb{k} -category of the form $\hat{A}/\langle\phi\rangle$ for some automorphism ϕ of the repetitive category \hat{A} that sends the 0-part $A^{[0]}$ to an n -part $A^{[n]}$ for some $n \in \mathbb{Z}$. We give a derived equivalence classification of generalized multifold extensions of piecewise hereditary algebras of tree type.

- 48 Hideto Asashiba (Shizuoka Univ.)[#] Induced pseudofunctors and derived equivalences of oplax 2-representations of a category 15

Summary: We fix a commutative ring \mathbb{k} and a small category I , and denote by $\mathbb{k}\text{-Cat}$ ($\mathbb{k}\text{-Tri}$) the 2-category of small (resp. small triangulated) \mathbb{k} -categories. It is shown that the composite of an oplax functor followed by a pseudofunctor becomes an oplax functor. This is used to define the “derived module category” $\mathcal{D}(\text{Mod}X): I \rightarrow \mathbb{k}\text{-Tri}$ for each oplax functor $X: I \rightarrow \mathbb{k}\text{-Cat}$, which is a generalization of a \mathbb{k} -category with a group action. This enables us to define derived equivalences between such oplax functors X , and by considering Grothendieck constructions we can glue derived equivalences between \mathbb{k} -categories together. An example of gluing of derived equivalences will be presented.

- 49 Hiroki Abe (Oyama Nat. Coll. of Tech.)[#] Tilting modules arising from two-term tilting complexes 10

Summary: We show that every two-term tilting complex over an Artin algebra has a tilting module over a certain factor algebra as a homology group. Also, we determine the endomorphism algebra of such a homology group, which is given as a certain factor algebra of the endomorphism algebra of the two-term tilting complex. Thus, every derived equivalence between Artin algebras given by a two-term tilting complex induces a derived equivalence between the corresponding factor algebras.

50 Masahide Konishi (Nagoya Univ.)[#] Selfinjectivity of algebras arising from tiling quivers and their potentials 10

Summary: Iyama and Herschend proved the selfinjectivity of some classes of algebras arising from quiver with potentials. These can be obtained from originals as a mutation for vertices on the same Nakayama orbits. The originals are n -cycles, pyramids and squares, they are all planar. We define tiling quivers and potentials on these. Then pyramids and squares can be obtained as a fullsubquiver of tiling quivers. We prove that, only pyramids and squares have selfinjectivity in fullsubquiver of tiling quivers.

51 So Okada (Kyoto Univ.)[#] On Euler characteristics for large Kronecker quivers 10

Summary: We study Euler characteristics of moduli spaces of stable representations of m -Kronecker quivers for $m \gg 0$. Using a recently obtained formula by Manshot-Pioline-Sen for quiver representations, we prove that for each coprime dimension vector and $m \gg 0$, Euler characteristics of the moduli spaces give the Euler characteristic of the moduli space of stable representations of the dimension vector $(1, \dots, 1)$ of some bipartite quiver. Then, for coprime dimension vectors we study an asymptotic log formula of Euler characteristics. We also study a normalized asymptotic log formula of Euler characteristics in terms of slopes of large coprime dimension vectors and $\ln(m)$, motivated by so-called Douglas' conjecture.

52 Takahiko Furuya (Tokyo Univ. of Sci.)^{*} Hochschild cohomology of cluster-tilted algebras of types A and D ... 15
Takao Hayami (Hokkai-Gakuen Univ.)

Summary: In this talk we show that all cluster-tilted algebras of Dynkin type A are precisely $(2, 1)$ -stacked monomial algebras, and then study their Hochschild cohomology rings modulo nilpotence. We also prove that the Hochschild cohomology rings modulo nilpotence for several cluster-tilted algebras of Dynkin type D are isomorphic to the polynomial ring $K[x]$.

53 Takuma Aihara (Chiba Univ.) Dimensions of triangulated categories with respect to subcategories .. 15
Tokuji Araya (Tokuyama Coll. of Tech.)
Osamu Iyama (Nagoya Univ.)
Ryo Takahashi (Nagoya Univ./MSRI)
Michio Yoshiwaki (Osaka City Univ.)

Summary: We will introduce the concept of the dimension of a triangulated category with respect to a fixed full subcategory. For the bounded derived category of an abelian category, upper bounds of the dimension with respect to a contravariantly finite subcategory and a resolving subcategory are given. Our methods not only recover some known results on the dimensions of derived categories in the sense of Rouquier, but also apply to various commutative and non-commutative noetherian rings.

17:00–18:00 Talk invited by Algebra Section

Hyohe Miyachi (Osaka City Univ.)[#] Comparison between module categories over modular quantum general linear groups

Summary: In the talk, we would like to summarize the results on comparing finite dimensional module categories over quantum general linear groups in different quantum characteristics. Here, roughly speaking, in the characteristic zero case a quantum characteristic means the order of the parameter of the quantum general linear group. And any of those module categories is highly non semisimple and known to be equivalent to a module category of the corresponding affine Lie algebra in a fixed negative level in the case of characteristic zero. So, our results enter in so-called Lusztig problem and give us a new insight on those topics. Lusztig’s famous character formula for simple modules is written purely in term of affine Weyl groups and here the quantum characteristic information disappear in some sense. We shall realize this disappearance as a shadow of our equivalences and show that any module category with a quantum characteristic e is inside the one with the quantum characteristic $e+1$ like countably infinite Russian Matryoshka dolls. To deduce those result, we came up from Broue’s abelian defect group conjecture, in especially, finite general linear groups and symmetric groups, which gives us a hopeful light recovering global information on finite group algebras from easier local ones via derived equivalences. sl_2 -categorifications, perverse equivalences, Kashiwara crystals, Steinberg’s tensor product theorem and Donkin’s result on truncation functors play important roles.

September 21st (Fri) Conference Room I

9:00–11:00

54 Tomohiro Iwami * Certain refinements of a projectivity criterion according to V. V. Shokurov (Kyushu Sangyo Univ.) and the log minimal model program for slc pairs 10

Summary: Around 1995, V. V. Shokurov posed the conjectural form of a projectivity criterion, motivated on a conjecture for rational connected varieties by Janos Kollar, also as an application of the Log Minimal Model Program (LMMP). After several years, Kollar had tried to construct the moduli space of varieties of general type in terms of application of LMMP for its good compactification. So, recently Kollar and Osamu Fujino have achieved several preparatory theories of LMMP for semi-log canonical (slc) pairs, based on the construction of an algebraic space as a coarse moduli by groupoids according to Sean Keel and Shigefumi Mori. In this talk, the author will try to show a little improvements of a projectivity criterion according to Shokurov based on the LMMP for slc pairs.

55 Makoto Sakurai [#] Geometric quantization of Wess–Zumino–Witten model and virtual localization formula 15

Summary: Wess–Zumino–Witten model is a well-studied supersymmetric conformal field theory with Lie-algebra theoretic Hamiltonians of “A-model”. In this talk, I will report, rather, the “I-model” with $\mathcal{N} = (0, 2)$ type for Chern–Simons gauge theory which Sakurai studied in 2007 from chiral algebras and differential graded Lie algebras. Notice, however, that this report is not the well-known deformation quantization of Poisson manifolds with homotopy L_∞ algebras, let alone the pre-quantization and polarization for WKB approximation. I will try to extend the so-called “virtual localization” formulation of generalized motivic integration of closed string theory for flag variety G/B , to more general Kähler manifolds with possible singularity, in order to clarify physicists’ naive supersymmetry algebras from elliptic genus.

- 56 Shigeru Iitaka (Gakushuin Univ.)[#] sharp estimate of the birational invariant k in terms of $(2,1)$ genera 15

Summary: Let S be a nonsingular rational surface and D a nonsingular curve on S . Suppose that $m \geq a \geq 1$. Then $P_{m,a}[D] = \dim |mK_S + aD| + 1$ are called mixed plurigenera, which depend on S and D .

It is my understanding that these invariants embody the essential geometric properties of the curve D on S .

$P_{1,1}[D]$ turns out to be the genus of D , denoted by g . We obtain sharp estimate of the birational invariant k in terms of $P_{2,1}[D]$.

- 57 Takanori Ayano (Osaka Univ.)[#] On series expansion around the origin of sigma functions for telescopic curves 10

Summary: Recently, sigma functions for algebraic curves become important in mathematical physics, number theory, and cryptography. Nakayashiki constructed the sigma functions for (n, s) curves, and gave an addition formula and the series expansion around the origin of the sigma functions for (n, s) curves. On the other hand, the author constructed the sigma functions for telescopic curves proposed by Miura, which include the (n, s) curves. In this talk, we generalize the addition formula to the case of the telescopic curves, and give the series expansion around the origin of the sigma functions for the telescopic curves.

- 58 Tohru Gotoh * A holomorphic section relating to 2-pointed Weierstrass gap set 10
(Nat. Defense Acad. of Japan)

Summary: We construct a holomorphic section of a certain holomorphic line bundle whose zero set consists of pairs of points with cardinality of the Weierstrass gap sets greater than the minimal value.

- 59 Kenta Watanabe (Osaka Univ.)^{*} On the Weierstrass semigroups for pointed curves on K3 surfaces with Picard number one 10

Summary: We work over the complex number field \mathbb{C} . Let C be a smooth projective curve and let p be a point on C . Then, we call a natural number n a gap if there is no meromorphic function which is holomorphic on $C \setminus \{p\}$ and has a pole of order n at p . For a pointed curve (C, p) , let $G(p)$ be the set of gaps at p . Then, we call the semigroup $H(p) = \mathbb{N}_0 \setminus G(p)$ a Weierstrass semigroup at p , where $\mathbb{N}_0 = \mathbb{N} \cup \{0\}$. In this talk, the author will deal with a pointed curve (C, p) on a K3 surface X with Picard number one which is given by a double cover $\pi : X \rightarrow \mathbb{P}^2$ and describe the Weierstrass semigroup for such a pointed curve (C, p) .

- 60 Ryo Kawaguchi (Kyushu Sangyo Univ.)[#] Weierstrass gap sequences at total ramification points on curves on a toric surface 15

Summary: Let C be a smooth complex projective algebraic curve, and P a point on C . A natural number n is called a gap value at P if there is no meromorphic function on C which has a pole only at P of order n . The set of gap values is called a Weierstrass gap sequence at P . In the case where $\text{gon}(C)$ is two or three, Weierstrass gap sequences can be classified according to the ramification index at P of the gonality morphism of C . In this talk, we assume that C lies on a toric surface, and compute Weierstrass gap sequences at total ramification points of the gonality morphism of C .

- 61 Katsuhisa Furukawa (Waseda Univ.)[‡] Duality with expanding maps and shrinking maps, and its applications to Gauss maps 15

Summary: We study expanding maps and shrinking maps of subvarieties of Grassmann varieties in arbitrary characteristic. The shrinking map was studied independently by Landsberg and Piontkowski in order to characterize Gauss images. To develop their method, we introduce the expanding map, which is a dual notion of the shrinking map and is a generalization of the Gauss map. Then we give a characterization of separable Gauss maps and their images, which yields results for the following topics:

- (1) Linearity of general fibers of separable Gauss maps;
- (2) Generalization of the characterization of Gauss images;
- (3) Duality on one-dimensional parameter spaces of linear subvarieties lying in developable varieties.

11:00–12:00 Talk invited by Algebra Section

- Yoshinori Gongyo (Univ. of Tokyo)[‡] Log pluricanonical representations and abundance

Summary: I will talk about importance of the abundance conjecture and semi-log canonical pairs. And I will show a relation of the finiteness of log pluricanonical representations for projective log canonical pairs with semi-ample log canonical divisor and the abundance conjecture for semi-log canonical pairs. I will explain the finiteness results of the representation.

14:15–15:45

- 62 Takayuki Hibi (Osaka Univ.)[‡] Toric rings arising from cyclic polytopes 15
 Akihiro Higashitani (Osaka Univ.)
 Lukas Katthän (Univ. Marburg)
 Ryota Okazaki (Osaka Univ.)

Summary: Let $\mathcal{P} \subset \mathbb{R}^d$ be an integral cyclic polytope of dimension d and let $K[\mathcal{P}] = K[\mathbb{Z}_{\geq 0}\mathcal{A}_{\mathcal{P}}]$ denote its associated semigroup K -algebra, where $\mathcal{A}_{\mathcal{P}} = \{(1, \alpha) \in \mathbb{R}^{d+1} : \alpha \in \mathcal{P}\} \cap \mathbb{Z}^{d+1}$ and K is a field. First, we consider the problem when \mathcal{P} is normal or non-very ample. Moreover, we also discuss when $K[\mathcal{P}]$ is Cohen–Macaulay or Gorenstein. In addition, we study the normality of the other semigroup K -algebra $K[Q]$ arising from an integral cyclic polytope, where Q is a semigroup generated only with its vertices.

- 63 Kazunori Matsuda (Nagoya Univ.)^{*} Characterization of Gorenstein strongly Koszul Hibi rings by invariants
 Takahiro Chiba (Nagoya Univ.) of F -singularities 15

Summary: Hibi rings are a kind of graded toric ring on a finite distributive lattice $J(P)$, where P is a partially ordered set. In this talk, we compute diagonal F -thresholds and F -pure thresholds of Hibi rings and give a characterization of Hibi rings which satisfy the equality between these invariants in terms of its trivialness in the sense of Herzog–Hibi–Restuccia.

- 64 Futoshi Hayasaka (Kagoshima Nat. Coll. of Tech.)^{*} Asymptotic periodicity of primes associated to multigraded modules 10

Summary: In this talk, we will investigate the asymptotic behavior of the set of primes associated to a graded ring extension of Noetherian multigraded rings and modules, and report that the periodicity occurs in a cone. The previous known results on this subject are recovered as a special case. As a consequence, by using the periodicity of associated primes, we get the same asymptotic behavior of the grade. This extends our previous result that I reported in the MSJ Autumn Meeting 2011 at Shinshu University.

- 65 Ryota Okazaki (Osaka Univ.)[#] On a minimal free resolution of a Borel fixed ideal and its supporting
Kohji Yanagawa (Kansai Univ.) CW complex 15

Summary: In this talk, we present a “new” construction of a minimal free resolution of a Borel fixed ideal. The main tool for the construction is the “alternative polarization” of the ideal. Our resolution has a nice property which the one due to Eliahou and Kervaire does not possess. Our construction is a generalization of Nagel–Reiner’s, and the resolution also can be constructed by applying Batzies–Welker’s theory using discret Morse theory due to Forman. In particular, it is cellular. Moreover our resolution is supported by a regular CW complex, and by a cell decomposition of a ball when the corresponding ideal is Cohen–Macaulay.

- 66 Yosuke Kuratomi * On Goldie extending modules and extending modules 10
(Kitakyushu Nat. Coll. of Tech.)

Summary: A module M is said to be \mathcal{G} -extending (*Goldie extending*) if, for any submodule X of M , there exist an essential submodule Y of X and a direct summand M' of M such that Y is essential in M' . The concept of \mathcal{G} -extending modules were introduced by Akalan–Birkenmeier–Tercan. In this talk, we consider a generalization of relative injectivity and apply it to the study of the open problem: When is a direct sum of \mathcal{G} -extending (uniform) modules \mathcal{G} -extending?

- 67 Yousuke Kuratomi * On semi-lifting modules 10
(Kitakyushu Nat. Coll. of Tech.)

Summary: We say that M is a (D'_1) -module if, for any submodule X of M , there exist a submodule X^* of M and a direct summand Y of M such that X and Y are co-essential submodules of X^* in M . We say that a module M is semi-lifting if any direct summand of M is a (D'_1) -module. A (D'_1) -module is a dual to a Goldie-extending module which was introduced by Akalan–Birkenmeier–Tercan as a generalization of extending modules.

In this talk, we give some characterizations of semi-lifting modules and (D'_1) -modules. In addition, we consider a generalization of relative projectivities and apply it to the study of direct sums of semi-lifting modules.

15:45–16:45 Talk invited by Algebra Section

Shigeru Kuroda (Tokyo Metro. Univ.)[#] Wild automorphisms of a polynomial ring

Summary: Although polynomial rings are basic objects in mathematics, there still exist many challenging open problems concerning polynomial rings, such as the Jacobian Conjecture and the cancellation problem. The main objective of Affine Algebraic Geometry is to study deep properties of polynomial rings. In the study of Affine Algebraic Geometry, automorphisms of a polynomial ring are important, because they relate with several central problems in this field. In this talk, we discuss recent researches of automorphisms of polynomial rings. Let k be a field, and $R = k[x_1, \dots, x_n]$ the polynomial ring in n variables over k . We say that $\phi \in \text{Aut}_k(R)$ is *elementary* if $(\phi(x_1), \dots, \phi(x_n)) = (x_1, \dots, x_{i-1}, ax_i + f, x_{i+1}, \dots, x_n)$ holds for some $1 \leq i \leq n$, $a \in k^\times$ and $f \in k[x_1, \dots, x_{i-1}, x_{i+1}, \dots, x_n]$. The subgroup $T(n, k)$ of $\text{Aut}_k(R)$ generated by all the elementary automorphisms is called the *tame subgroup*. The *Tame Generators Problem* asks whether $\text{Aut}_k(R) = T(n, k)$. The answer to this problem was known to be affirmative for $n \leq 2$, yet the case of $n \geq 3$ was open for a long time. In 2003, Shestakov–Umirbaev solved the problem in the negative when $n = 3$ and $\text{ch}(k) = 0$. In this talk, we give a generalization of the Shestakov–Umirbaev theory, and analyze the structure of $\text{Aut}_k(R) \setminus T(n, k)$ in various ways. We also mention the situation in the case of $\text{ch}(k) > 0$.

Geometry

September 18th (Tue) Conference Room VIII

9:00–12:00

- 1 Sadahiro Maeda (Saga Univ.)* Some characterizations of isoparametric hypersurfaces in a sphere 15

Summary: We give some characterizations of isoparametric hypersurfaces in a sphere by the extrinsic shape of some geodesics on these hypersurfaces.

- 2 Sadahiro Maeda (Saga Univ.)* Congruence classes of minimal ruled real hypersurfaces in a nonflat
Toshiaki Adachi (Nagoya Inst. of Tech.) complex space form 15
Tuya Bao
(Inner Mongolia Univ. for Nat.)

Summary: We investigate the number of congruence classes of all minimal ruled real hypersurfaces with respect to the full isometry group of a nonflat complex space form.

- 3 Kazuhiro Okumura [#] η -Einstein real hypersurfaces in a nonflat complex space form 10
(Asahikawa Nat. Coll. of Tech.)

Summary: In this talk, we introduce a classification of 3-dimensional real hypersurfaces satisfying $A\xi = 0$ in a 2-dimensional nonflat complex space form. Here, A is the shape operator of real hypersurfaces and ξ is the characteristic vector field of real hypersurfaces. Moreover, we also give properties of these real hypersurfaces.

- 4 Kazuyuki Enomoto [#] Total torsion of curves in E^3 15
(Tokyo Univ. of Sci.)
Jin-ichi Itoh (Kumamoto Univ.)

Summary: The total torsion of smooth curves in E^3 is defined as the total integral of the torsion. This notion is extended to piecewise smooth curves. We study the infimum of the total torsion in a certain set of curves, where the endpoints, the osculating planes at the endpoints and the length are all prescribed. We show how the infimum is calculated from the boundary data.

- 5 Naoyuki Koike (Tokyo Univ. of Sci.)* The classifications of certain kind of isoparametric submanifolds in
non-compact symmetric spaces 15

Summary: In this talk, I state that full irreducible curvature-adapted isoparametric submanifolds of codimension greater than one in symmetric spaces of non-compact type are principal orbits of Hermann actions and explain the outline of the proof. Also, I classify such submanifolds in each irreducible symmetric space of non-compact type.

- 6 Makiko Tanaka (Tokyo Univ. of Sci.)* The intersection of two real forms in Hermitian symmetric spaces of
Hiroyuki Tasaki (Univ. of Tsukuba) compact type II 15

Summary: We minutely describe the intersection of two real forms in a Hermitian symmetric space of compact type. In the irreducible case we have already done it. This time we reduce the description of the intersection of two real forms to that in some special cases. Using the information of the group of all isometries obtained by Takeuchi we can describe the intersection in the special cases and in all cases. In particular we obtain the intersection number of two real forms in a Hermitian symmetric space of compact type.

- 7 Hiroshi Iriyeh (Tokyo Denki Univ.)* On the structure of the intersection of real flag manifolds in a complex
 Takashi Sakai (Tokyo Metro. Univ.) flag manifold 10
 Hiroyuki Tasaki (Univ. of Tsukuba)

Summary: On a complex flag manifold we can define k -symmetric structures for $k \geq k_0$, where k_0 is determined dependently on the complex flag manifold. We show that the fixed point set of the k -symmetry is independent of k . We also show that the intersection of real flag manifolds in the complex flag manifold consisting of sequences of complex subspaces in a complex vector space is an antipodal set, which is a generalization of that in a compact Riemannian symmetric space.

- 8 Akira Kubo (Hiroshima Univ.)# Congruency of orbits of the solvable parts of parabolic subgroups 10
 Hiroshi Tamaru (Hiroshima Univ.)

Summary: This talk deals with the action of the solvable part $S_{\mathfrak{p}}$ on a Riemannian symmetric space of noncompact type M . We prove that this action has the congruency of orbits, that is, all orbits are isometrically congruent to each other, and as a consequence of the result, we show that all orbits are always minimal and Einstein in M . And besides, we present other examples of actions to have the congruency of orbits.

- 9 Kastuei Kemnotsu (Tohoku Univ.)* On the global existence of generalized rotational hypersurfaces with
 Takeyuki Nagasawa (Saitama Univ.) prescribed mean curvature in the Euclidean 15

Summary: We prove that any piece of a rotational hypersurface with prescribed mean curvature function in a Euclidean space can be uniquely extended infinitely, which generalizes the results by Euler and Delaunay for surfaces of revolution with constant mean curvautre. Next, we prove the same kind of theorem for generalized rotational hypersurfaces of all types. The key in talk paper shows the existence of solutions for singular initial value problems which arise from the analysis of ordinary differential equations of generating curves of those hypersurfaces.

- 10 Sung-Hong Min (KIAS)# Optimal isoperimetric inequalities for complete proper minimal sub-
 Keomkyo Seo manifolds in hyperbolic space 15
 (Sookmyung Women’s Univ.)

Summary: In this talk, we prove an optimal linear isoperimetric inequality and the classical isoperimetric inequality under the ideal boundary volume condition for complete proper minimal submanifolds in hyperbolic space. By proving the monotonicity theorem, we further obtain a sharp lower bound for the Euclidean volume, which is an extension of Fraser–Schoen and Brendle’s recent results to hyperbolic space. Moreover we introduce the Möbius volume in B^n , the Poincaré ball model of hyperbolic geometry, to prove an isoperimetric inequality via the Möbius volume.

- 11 Keomkyo Seo # Geometric inequalities for submanifolds with bounded mean curvature
 (Sookmyung Women’s Univ.) 15

Summary: Several geometric inequalities on a submanifold with variable mean curvature in a Riemannian manifold whose sectional curvature is bounded above by a constant will be discussed. The first Dirichlet eigenvalue estimates for submanifolds with bounded mean curvature will be considered as well.

14:15–16:00

- 12 Hironori Kumura (Shizuoka Univ.) Exit radii of submanifolds from cylindrical domains in warped product manifolds 15

Summary: Let $U_B(p_0; \rho_1) \times M_V$ be a cylindrically bounded domain in a warped product space $\overline{M} := M_B \times_f M_V$, and M be an isometrically immersed submanifold in \overline{M} . The purpose of this talk is to state an explicitly calculated raddi of geodesic balls of M which first exit from $U_B(p_0; \rho_1) \times M_V$, in case its mean curvature is sufficiently small and the lower bound of the Ricci curvature of M do not so rapidly diverge to $-\infty$ at infinity.

- 13 Hiraku Nozawa (IHÉS)[#] On Haefliger cohomology of Riemannian foliations 15
 José Ignacio Royo Prieto (Univ. Basque Country)

Summary: A foliated manifold (M, \mathcal{F}) is called *taut* if M admits a metric g such that every leaf of \mathcal{F} is a minimal submanifold of (M, g) . The Haefliger cohomology of foliated manifolds was introduced by Haefliger to characterize the tautness. It is often infinite dimensional and inaccessible for general foliations. But Masa and Domínguez showed that the Haefliger cohomology of Riemannian foliations on closed manifolds are isomorphic to the reduced Haefliger cohomology, which is finite dimensional and computable. As an application, Domínguez showed that the tenseness, a twisted version of tautness, of any Riemannian foliation on a compact manifold. We extend their computation for Riemannian foliations under weaker assumption of compactness. We also provide simpler proofs of Domínguez tenseness theorem.

- 14 Oliver Goertsches (Univ. Hamburg)[#] On vanishing and rigidity of basic cohomology of Sasakian manifolds
 Hiraku Nozawa (IHÉS) 15
 Dirk Töben (Univ. São Paulo)

Summary: The basic cohomology and basic Dolbeault cohomology of Reeb flows of Sasakian manifolds are fundamental invariants similar to de Rham and Dolbeault cohomology of Kähler manifolds, respectively. In this talk, we will explain some vanishing and rigidity results obtained mainly by the application of equivariant cohomology theory. Main results are as follows: 1) If two compact Sasakian manifolds are diffeomorphic as CR manifolds, then the dimension of their basic Dolbeault cohomology are equal. 2) If the Reeb flow of a compact Sasakian manifold has only finite closed orbits, then the (p, q) -th basic Dolbeault cohomology is trivial for $p \neq q$. Moreover, the dimension of basic Dolbeault cohomology ring is equal to the number of closed Reeb orbits.

- 15 Jesús Antonio Álvarez López [#] Characteristic classes of transversely homogeneous foliations 15
 (Univ. Santiago de Compostela)
 Hiraku Nozawa (IHÉS)

Summary: Let G be a simple Lie group of real rank one, and S the boundary of the corresponding symmetric space of noncompact type $(\mathbf{H}_{\mathbb{R}}^n, \mathbf{H}_{\mathbb{C}}^n, \mathbf{H}_{\mathbb{H}}^n \text{ or } \mathbf{H}_{\mathbb{O}}^2)$. We show the finiteness of the possible values of the characteristic classes of foliations on a fixed manifold whose transverse structures are modeled on the G -action on S , except the case where $G = SO(n + 1, 1)$ for even n . For this exceptional case, we construct examples of foliations on a manifold which break the finiteness and show a weaker finiteness result. These are generalizations of a finiteness theorem of characteristic classes of transversely projective foliations on a fixed manifold by Brooks–Goldman and Heitsch to other transverse structures. We also show Bott–Thurston–Heitsch type formulas to compute the Godbillon–Vey classes of certain foliated bundles, and then obtain a rigidity result on foliations on the unit tangent sphere bundles of hyperbolic manifolds.

- 16 Seoung Dal Jung (Jeju Nat. Univ.)[#] Transverse Killing forms on foliated Riemannian manifolds 15

Summary: On a closed, connected Riemannian manifold with a Riemannian foliation of codimension q , if the curvature endomorphism F is non-positive, then any transverse Killing r -forms ($1 \leq r \leq q - 1$) are parallel. And in case of Kähler foliation, if the mean curvature vector of the foliation is transversally holomorphic, then any transverse Killing r -forms ($2 \leq r \leq q$) are parallel.

- 17 Hiraku Abe (Tokyo Metro. Univ.)[#] Schubert calculus for weighted Grassmannians 15
Tomoo Matsumura (KAIST)

Summary: The weighted Grassmannian $wGr(d, n)$, introduced by Corti–Reid, is defined in a weighted Projective space by the Plücker relations as weighted homogeneous polynomials with appropriate weights. It is a projective variety with at worst orbifold singularity and carries a natural $(n - 1)$ -dimensional torus action. We study its equivariant cohomology over the rational coefficients. Namely, we introduce the weighted Schubert classes that form a basis of the equivariant cohomology over the cohomology of the classifying space of the torus and we compute the structure constants in terms of them. We find a basis of the cohomology of the classifying space, in which those structure constants are polynomials with non-negative coefficients under a certain condition on the weights of $wGr(d, n)$.

16:15–17:15 Talk invited by Geometry Section

- Toshihiro Shoda (Saga Univ.)[#] On Morse index of minimal surfaces

Summary: Morse index suggests a gap between a given minimal surface and the area minimizing surface in terms of Analysis. It is important subject, but there were few results for this 20 years. This time, we calculated Morse index of the classical minimal surfaces. So I would like to show an outline of that. It is joint work with Professor Norio Ejiri, Meijo University.

September 19th (Wed) Conference Room VIII + IX

10:50–11:50 Award Lecture for 2012 Geometry Prize

- Ken'ichi Ohshika (Osaka Univ.)[#] Topological structure of deformation spaces of Kleinian groups

Summary: In the theory of Kleinian groups, now the attention is focused on studying topological structure of deformation spaces of Kleinian groups after big problems like tameness conjecture and the ending lamination conjecture were solved. In this talk, I shall discuss recent progresses in studies of the deformation spaces and my work on the boundaries of these spaces.

13:15–14:15 Award Lecture for 2012 Geometry Prize

- Yukinobu Toda (Univ. of Tokyo)[#] Stability conditions and Donaldson–Thomas type invariants on Calabi–Yau 3-folds

Summary: Donaldson–Thomas (DT) invariants were introduced by Richard Thomas in 1998, and they count holomorphic vector bundles (more precisely stable coherent sheaves) on Calabi–Yau 3-folds. The rank one DT invariants count holomorphic curves in X , and are conjectured to be equivalent to the Gromov–Witten invariants by Maulik–Nekrasov–Okounkov–Pandharipande. In this talk, I will survey my work on the generalization of DT invariants counting certain stable objects in the derived category of coherent sheaves, and their wall-crossing formula. I will show that the wall-crossing formula of our DT type invariants establish several new formulas of the generating series of the original DT invariants, and solve several open problems in DT theory related to the MNOP conjecture.

September 20th (Thu) Conference Room VIII

9:00–12:00

- 18 Hiroaki Izumi (Elpida Memory, Inc.)[#] The mathematical full solution of business cycle as a phase transition
 15

Summary: Hiroaki Izumi and Prof. Katsuhiko Takahashi (Graduate School of Engineering, Hiroshima University) got the full solution of business cycle in the market economy as a phase transition from the view point of mathematical economics. And for the solution, we used game theory without using gauge theory. In the process, we got the solution of “mean field approximation”, “symmetry breaking” and “scale invariant”.

- 19 Tetsuya Nagano (Univ. of Nagasaki)[#] Linear parallel displacements along a infinitesimal parallelogram and
 “curvature” 15

Summary: This is a subject in Finsler geometry. Flag curvature is well known as the study of curvature of Finsler space. However, there is not any studies of curvature by parallel displacement. By using linear parallel displacements, (which was defined by speaker in 2008), along a infinitesimal parallelogram, speaker investigates a “curvature” of the Finsler space. The content of this talk is a trial of such studies.

- 20 Tomoyo Kanazawa[#] Wigner function of the MIC-Kepler problem 10
 (Tokyo Univ. of Sci.)
 Akira Yoshioka (Tokyo Univ. of Sci.)

Summary: The phase-space formulation of nonrelativistic quantum mechanics is constructed on the basis of a deformation of classical mechanics by using the Moyal product. We have taken up the MIC-Kepler problem as an actual example to try this formalism, and already showed its energy-eigenspace by the method of a $U(1)$ reduction. We then defined the Moyal product with the canonical coordinates of the phase space which is cotangent bundle of the principal fiber bundle, and solved its characteristic equation. Now we have considered the two local coordinates on the reduced phase space to express the Hamiltonian and eigenfunction of the MIC-Kepler problem within the limit of their intersection.

- 21 Tsukasa Takeuchi (Tokyo Univ. of Sci.)[#] A recursion operator for the geodesic flow of Schwarzschild metric 10
 Kiyonori Hosokawa
 (Tokyo Univ. of Sci.)
 Shinsuke Takatani (Tokyo Univ. of Sci.)

Summary: It is known that a vector field X is separable, integrable and Hamiltonian for certain symplectic structure when X admits an invariant, mixed, diagonalizable tensor field T with vanishing Nijenhuis torsion and doubly degenerate eigenvalues without stationary points. Then, the vector field is a separable and completely integrable Hamiltonian system. The operator T is called a recursion operator.

Now, we consider geodesic flow on the Euclidian space with pseudo-Riemann metric and Schwartzchild metric as a concrete example, and we construct recursion operators.

- 22 Yukiko Konishi (Kyoto Univ.)* Mixed Frobenius structure and local A-model 15
 Satoshi Minabe (Tokyo Denki Univ.)

Summary: We introduce the notion of the Frobenius filtration on an algebra and the mixed Frobenius structure (MFS). They are generalizations of the Frobenius algebra and the Frobenius structure in a sense that the graded polarized mixed Hodge structure is a generalization of the polarized Hodge structure. We give constructions of the Frobenius filtration and the MFS using a nilpotent element. Applying the construction, we obtain a MFS on the cohomology of weak Fano toric surfaces, which we think the right answer to the question “what is the Frobenius structure for local A-model”.

- 23 Tomoaki Yatsui # On the prolongations of free pseudo-product fundamental graded Lie
 (Asahikawa Med. Univ.) algebras 10

Summary: We introduce the notion of free pseudo-product fundamental graded Lie algebras and study the prolongations of complex free pseudo-product fundamental graded Lie algebras.

- 24 Yuichiro Tanaka (Univ. of Tokyo)* Visible actions on flag varieties and a generalization of the Cartan
 decomposition 15

Summary: Motivated by T. Kobayashi’s theory of visible actions on complex manifolds [Publ RIMS, 2005], a new decomposition theory of Lie groups is studied.

We consider a special setting where G is a compact Lie group, L , H its Levi subgroups and K a Chevalley–Weyl involution-fixed point subgroup. Since K gives a totally real submanifold in both G/H and G/L , if $G = LKH$ holds, then L -action on G/H , H -action on G/L and G -action on the product manifold of G/H and G/L are strongly visible, and thus we obtain multiplicity-free theorems of L , H and G respectively. The main result is a complete classification of a triple (G, H, L) such that $G = LKH$ holds. Furthermore, we give a subset B of K satisfying $G = LBH$ (generalized Cartan decomposition) explicitly.

- 25 Yoshihiko Matsumoto (Univ. of Tokyo)# The second variational formula of the total Q -curvature in conformal
 geometry 15

Summary: Branson’s Q -curvature of even-dimensional closed conformal manifolds integrates to a global conformal invariant called the total Q -curvature. While it is topological in two dimensions and is essentially the Weyl action in four dimensions, in the higher-dimensional cases its geometric meaning remains mysterious. It is known that the first metric variation of the total Q -curvature coincides with the Fefferman–Graham obstruction tensor. In this talk, the second variational formula will be presented in the case of conformally Einstein manifolds, which is a typical case where the obstruction tensor vanishes. The positivity of the second variation will be discussed in connection with the smallest eigenvalue of the Lichnerowicz Laplacian acting on transverse-traceless symmetric 2-tensors.

- 26 Hiroaki Ishida (Osaka City Univ.)# Complex manifolds with maximal torus actions 15

Summary: Whenever a compact torus $(S^1)^m$ acts on a connected manifold M^n of dimension n effectively, the transformation group theory tells us that the dimension of each orbit should be greater than or equal to $2m - n$. In case there is an orbit of dimension $2m - n$, we can say that the action of $(S^1)^m$ on M is “maximal” in some sense. In this talk, we describe compact connected complex manifolds with “maximal” torus actions.

- 27 Sanae Kurosu (Tokyo Univ. of Sci.)* A characterization of a pluriharmonic affine immersion of codimension two 10

Summary: We will give a characterization for a pluriharmonic affine immersion to an affine space of codimension two by using the index of relative nullity.

- 28 Hiroshi Matsuzoe (Nagoya Inst. of Tech.)* Quasi-statistical manifolds and geometry of affine distributions 10
Takashi Kurose (Kwansei Gakuin Univ.)
Masayuki Henmi (Inst. of Stat. Math.)

Summary: A statistical manifold admitting torsion is a quantum or a non-integrable generalization of statistical manifolds, and an affine distribution is a non-integrable generalization of affine immersions. It is known that affine connections on quantum state spaces admit non-vanishing torsion in general. Statistical manifolds admitting torsion were introduced to formulate such geometric structures. In this talk, after the notion of a quasi-statistical manifold being introduced, their properties and the relationship with the geometry of affine distributions are studied.

- 29 Hiroshi Matsuzoe (Nagoya Inst. of Tech.)* Generalized conformal structures on statistical manifolds and geometry of q -exponential families 10
Atsumi Ohara (Univ. of Fukui)
Shun-ichi Amari (RIKEN)

Summary: Generalized conformal structures on statistical manifolds have been studied in affine differential geometry. Recently, such geometric structures have been applied to Tsallis statistics which are related to theory of complex systems. In addition, such geometric structures were refound in geometric theory of sequential estimation. In Tsallis statistics, q -exponential families are useful probability distributions, which are deformations of the standard exponential families. In this talk, geometry of q -exponential families and generalized conformal structures on statistical manifolds are studied.

14:15–16:15

- 30 Shin Kikuta (Sophia Univ.) Numerical comparison between Carathéodory measure hyperbolicity and positivity of canonical bundle along subvarieties 20

Summary: At the MSJ Autumn Meeting 2010, I reported about an inequality which expresses numerically that the bigness of the canonical bundle is not less than the Carathéodory measure hyperbolicity over a compact complex manifold. Our purpose for this talk is to inform you that there exists such an inequality like this between two quantities measuring positivity of the canonical bundle and the Carathéodory measure hyperbolicity along subvarieties. The former is called the restricted volume for the canonical bundle, and the latter is related to a restricted Carathéodory measure introduced essentially by D. A. Eisenman. Moreover the inequality can be considered from the Nakai–Moishezon–Kleiman criterion to tell us numerically that the strong Carathéodory measure hyperbolicity implies the ampleness of the canonical bundle.

- 31 Mitsuhiro Imada (Keio Univ.)[#] Normality of complex contact manifolds 15

Summary: The definition of complex contact manifolds is analogous to real contact manifolds. In real contact geometry, we know that normal contact metric manifolds (called Sasakian manifolds) play an important role in physics. Then we can expect normal complex contact metric manifolds do so. In this talk, we show the relationship between the normal complex contact manifolds and its sectional curvatures, and construct a normal complex contact metric structure explicitly on the \mathbf{C}^* -quotient space by a projection from a hyperkähler manifold.

- 32 Yohsuke Imagi (Kyoto Univ.)* On the boundary of the Moduli space of special Lagrangian submanifolds 15

Summary: Special Lagrangian submanifolds are area-minimising Lagrangian submanifolds of a Calabi–Yau manifold. Let M be their moduli space, i.e., the space of all (compact) special Lagrangian submanifolds (of a Calabi–Yau manifold). Mclean proved that M is a manifold (of dimension $< \infty$). We may compactify M using Geometric Measure Theory. To understand the structure of \overline{M} , the compactified space, is very important, e.g., in the Strominger–Yau–Zaslow conjecture on a ‘mirror symmetry’ of special Lagrangian fibrations, and Joyce’s proposal to ‘count’ special Lagrangian submanifolds.

The purpose of this talk is to give a first step towards the understanding of the structure of \overline{M} ; I choose an ‘easy’ point $p \in \overline{M} \setminus M$, and show that a sufficiently small neighbourhood of p in \overline{M} is a manifold with boundary.

- 33 Hisashi Kasuya (Univ. of Tokyo)* Vaisman metrics on solvmanifolds and Oeljeklaus–Toma manifolds ... 15

Summary: We prove the non-existence of Vaisman metrics on some solvmanifolds with left-invariant complex structures. By this theorem, we show that Oeljeklaus–Toma manifolds does not admit Vaisman metrics.

- 34 Mitsuhiro Itoh (Univ. of Tsukuba)[#] Rigidity, volume entropy and Kähler, quaternionic Kähler Hadamard
Hiroyasu Satoh (Tokyo Denki Univ.) manifolds 10
Young Jin Suh (Kyungpook Nat. Univ.)

Summary: We will report the rigidity theorems of complex hyperbolic space and quaternionic hyperbolic space by means of volume entropy in the following way. Let (X, g, J) be an asymptotically harmonic, Kähler Hadamard manifold of $\dim_{\mathbb{C}} = 2n$ with a normalized metric as $Ric \geq -2(n+1)$. If $a = h(\xi, \xi)$, the value of the second fundamental form of the structure field $\xi = J\nabla B_{\theta}$ is equal or less than -2 on any horosphere associated to an ideal boundary point θ , then the volume entropy of (X, g, J) is equal or less than $2n$. Equality holds iff the manifold is a complex hyperbolic space of constant hol. curvature -4 . A similar theorem holds for quaternionic Kähler case.

- 35 Peng Fei Bai (Nagoya Inst. of Tech.)* On volumes of trajectory-balls for Kaehler magnetic fields 10
Toshiaki Adachi (Nagoya Inst. of Tech.)

Summary: Applying comparison theorems on normal magnetic Jacobi fields we estimate volumes of trajectory-balls for Kähler magnetic fields under some assumptions on sectional curvatures or Ricci curvatures of a base Kähler manifold.

- 36 Ayato Mitsuishi (Tohoku Univ.)* Locally Lipschitz contractibility of Alexandrov spaces and its applica-
Takao Yamaguchi (Univ. of Tsukuba) tions 20

Summary: In this talk, we report our recent result on the locally Lipschitz contractibility of finite dimensional Alexandrov spaces. We also present its applications to the Plateau problem and the simplicial volumes of Alexandrov spaces.

16:30–17:30 Talk invited by Geometry Section

Atsushi Kasue (Kanazawa Univ.)* Embedding of graphs and Rayleigh monotonicity law

Summary: In this talk, we take up two problems on finite or infinite graphs. After considering Rayleigh monotonicity law on embedding of graphs, we show two results. The first one is concerned about a geometric upper bound for the Cheeger constant of a finite graph embedded in the hyperbolic space in terms of the volume, the upper bound of the degree, and the embedding. The second one states that an infinite graph embedded in the hyperbolic space admits a lot of p -harmonic functions with finite p -Dirichlet sum if it is p -nonparabolic and p is greater than the dimension of the hyperbolic space minus one.

Complex Analysis

September 18th (Tue) Conference Room II

10:00–12:00

- 1 Hitoshi Shiraishi (Kinki Univ.)[#] Extensions of Nunokawa lemma for argument properties 15

Summary: Let $\mathcal{H}[a_0, n]$ be the class of function $p(z) = a_0 + a_n z^n + \dots$ which are analytic in the open unit disk \mathbb{U} . For $p(z) \in \mathcal{H}[1, 2]$, M. Nunokawa, S. Owa, N. Uyanik and H. Shiraishi (Math. Comput. Modelling. **55** (2012), 1245–1250) have shown some theorems for argument properties. The object of the present paper is to discuss some extensions of Nunokawa lemma and its applications for argument properties.

- 2 Toshio Hayami (Kinki Univ.)[#] A sufficient condition for p -valently harmonic functions 15

Summary: For a fixed p ($p = 1, 2, 3, \dots$), let $\mathcal{H}(p)$ be the class of functions $f(z)$ of the form $f(z) = h(z) + \overline{g(z)} = z^p + \sum_{n=p+1}^{\infty} a_n z^n + \overline{\sum_{n=p}^{\infty} b_n z^n}$ which are harmonic in the open unit disk $\mathbb{U} = \{z \in \mathbb{C} : |z| < 1\}$, and let $\mathcal{S}_{\mathcal{H}}(p)$ be the class of functions $f(z) \in \mathcal{H}(p)$ which are p -valent and sense-preserving in \mathbb{U} . Then, we say that $f(z) \in \mathcal{S}_{\mathcal{H}}(p)$ is a p -valently harmonic function in \mathbb{U} . In the present talk, we consider a sufficient condition on $h(z)$ for $f(z) \in \mathcal{H}(p)$, satisfying $g'(z) = z^{m-1}h'(z)$ ($m = 2, 3, 4, \dots$), to be in the class $\mathcal{S}_{\mathcal{H}}(p)$.

- 3 Tsubasa Itoh (Hokkaido Univ.)[#] Modulus of continuity of p -Dirichlet solutions in a metric measure space 15

Summary: Let $1 < p < \infty$ and let X be a metric measure space with a doubling measure and a $(1, p)$ -Poincaré inequality. Let Ω be a bounded domain in X . For a function f on $\partial\Omega$ we denote by $\mathcal{P}_{\Omega}f$ the p -Dirichlet solution of f over Ω . It is well known that if Ω is p -regular and $f \in C(\partial\Omega)$, then $\mathcal{P}_{\Omega}f$ is p -harmonic in Ω and continuous in $\overline{\Omega}$. We characterize the family of domains Ω such that improved continuity of boundary functions f ensures improved continuity of $\mathcal{P}_{\Omega}f$. We specify such improved continuity if X is Ahlfors regular and $X \setminus \Omega$ satisfies the p -capacity density condition.

- 4 Rikio Yoneda (Otaru Univ. of Commerce) * Toeplitz and Hankel operators on the Bergman spaces with closed range 15

Summary: In [2], S. Axler characterize the boundedness and the compactness of Hankel operator on the Bergman space. In this paper, we study the Hankel operators on the Bergman spaces with the closed range. And we study the Toeplitz on the Bergman spaces with closed range.

- 5 Fumi-Yuki Maeda (Hiroshima Univ.) * Approximate identities and Young type inequalities in Musielak–Orlicz spaces 15
 Mizuta Yoshihiro (Hiroshima Inst. of Tech.)
 Takao Ohno (Oita Univ.)
 Tetsu Shimomura (Hiroshima Univ.)

Summary: Our aim in this talk is to deal with approximate identities and Young type inequalities in Musielak–Orlicz spaces.

14:30–16:15

- 6 Yoshihiko Shinomiya (Tokyo Tech)[#] Veech holomorphic families of Riemann surfaces and Diophantine problems 15

Summary: A Veech group of a flat surface is the group of all derivatives of affine maps of the flat surface. A Veech group induces a holomorphic and locally-isometric embedding of the orbifold which is the quotient of the upper half-plane by the Veech group into the moduli space of the flat surface. Such embeddings give us holomorphic families of Riemann surfaces which we call Veech holomorphic families of Riemann surfaces. We characterize holomorphic sections of Veech holomorphic families of Riemann surfaces by points of flat surfaces. We also construct some Diophantine equations over function fields from certain Veech holomorphic families of Riemann surfaces and solve the equations by applying the characterization of holomorphic sections.

- 7 Masahiro Yanagishita (Waseda Univ.)[#] Teichmüller distance and Kobayashi distance on subspaces of the universal Teichmüller space 15

Summary: The universal Teichmüller space T is the deformation space of the unit disk in the complex plane. There exists two distances on T called the Teichmüller distance and the Kobayashi distance. It is known that these two distances on T coincide. For a metric subspace of T having a comparable complex structure with that of T , we can similarly consider whether or not the Teichmüller distance on the subspace coincides with the Kobayashi distance. In this paper, we give a sufficient condition for metric subspaces under which the problem above has a affirmative answer. Moreover, we introduce an example of such subspaces.

- 8 Hideki Miyachi (Osaka Univ.)[#] A Characterization of biholomorphic automorphisms of Teichmüller space 15

Summary: In this talk, I would like to give an alternative approach to the characterization of biholomorphic automorphisms on Teichmüller space, which was obtained by H. Royden, C. Earle, I. Kra, and V. Markovic. In our approach, we will see the action of the biholomorphism at infinity of Teichmüller space via the Gardiner–Masur embedding. This is a joint work with Ryosuke Mineyana (Osaka University).

- 9 Yohei Komori (Waseda Univ.)[#] On growth rates of 3-dimensional hyperbolic Coxeter prisms 15

Summary: Let P be a 3-dimensional hyperbolic Coxeter prism which is combinatorially the product of a 1-simplex with a 2-simplex. Kaplinskaya classified straight Coxeter prisms. When P is not straight, we can obtain P by pasting straight Coxeter prisms together along their common triangle face which is orthogonal to all their lateral faces. Our main result is that the growth rates of 3-dimensional hyperbolic Coxeter prisms are Perron numbers.

- 10 Katsuhiko Matsuzaki (Waseda Univ.)[#] Conjugation of a circle diffeomorphism group to a Moebius group 15

Summary: By using Teichmüller theories, we give a condition for a group of diffeomorphisms on the circle to be conjugated to a group of Möbius transformations by a diffeomorphism of the same regularity.

16:30–17:30 Talk invited by Complex Analysis Section

Toshiyuki Sugawa (Tohoku Univ.)[#] Generalization of the Schwarzian derivative —Towards more invariance and higher orders—

Summary: The Schwarzian derivative plays an important role in various fields of mathematics such as conformal mappings, uniformization, Teichmüller spaces, one-dimensional dynamics, integrable systems, conformal field theory and so on. Therefore, many people have been tempted to extend this notion in various directions. Most of known extensions concern higher dimensional analogy. In the present talk, we stick with one-dimensional case and propose two kinds of generalizations: higher-order invariant and projective Schwarzian derivatives. The first one is defined for nonconstant holomorphic mappings between Riemann surfaces with (smooth) conformal metrics. The latter one is for nonconstant holomorphic mappings from a projective (Riemann) surface with conformal metric to another projective surface, and it is less invariant, but simpler, than the first.

As applications, we will give univalence criteria for meromorphic functions on the unit disk in terms of the projective Schwarzian derivative of virtual order 3.

The present talk is based on the joint work with Seong-A Kim (Dongguk University, Korea).

September 19th (Wed) Conference Room II

10:00–12:00

11 Yan-Yan Wang (Nagoya Univ.)^{*} Variations of Bergman kernels for some explicitly given families of planar domains 20

Summary: We study the parameter dependence of the Bergman kernels on some planar domains depending on complex parameter in nontrivial “pseudoconvex” ways. Smoothly bounded cases are studied at first: when the domains are annuli, the Levi form for the logarithm of the Bergman kernels with respect to parameter approaches to 0 as the point tends to the boundary of the domain, and when the domains are discs it approaches to infinite as the point tends to the complement of a point in the boundary. Further, in non-smooth boundary cases, interesting phenomena are observed.

12 Shin Kikuta (Sophia Univ.) On restricted Carathéodory pseudo-volume forms (corrections) 20

Summary: At the MSJ Spring Meeting 2011, I gave a talk whose title was the same as that of this talk. I introduced there a notion of a restricted Carathéodory pseudo-volume form along a subvariety in a complex manifold and reported that the pseudo-volume form could be compared explicitly with the restricted volume of the canonical bundle in the compact setting. However my proof of a curvature inequality, which played a key role there, contained a crucial mistake. I cannot recover the proof completely so far, but I will give some corrections at this talk. To be a little more specific, we can make a comparison of the restricted volume with a smaller substitution than the original restricted Carathéodory pseudo-volume form.

13 Sachiko Hamano (Fukushima Univ.)[#] Log-plurisubharmonicity of metric deformations induced by Schiffer and harmonic spans 15

Summary: We study the variation of the metrics $s(t, \zeta)|d\zeta|^2$ and $\mathfrak{h}(t, \zeta)|d\zeta|^2$ induced by Schiffer and harmonic spans on the domain $D(t)$ in \mathbb{C}_ζ which varies in \mathbb{C}_ζ with a complex parameter t in a disk B in \mathbb{C}_t such that $\mathcal{D} = \cup_{t \in B}(t, D(t))$ is a 2-dimensional pseudoconvex domain in $B \times \mathbb{C}_\zeta$. We show that $\log s(t, \zeta)$ and $\log \mathfrak{h}(t, \zeta)$ are plurisubharmonic in \mathcal{D} .

- 14 Peter Duren (Univ. of Michigan)[#] Two-point distortion theorems for harmonic and pluriharmonic mappings 15
 Hidetaka Hamada (Kyushu Sangyo Univ.)
 Gabriela Kohr (Babeş-Bolyai Univ.)

Summary: Two-point distortion theorems are obtained for affine and linearly invariant families of harmonic mappings on the unit disk, with generalizations to pluriharmonic mappings of the unit ball in \mathbb{C}^n . In particular, necessary and sufficient conditions are given for a locally univalent harmonic or pluriharmonic mapping to be univalent.

- 15 Ian Graham (Univ. of Toronto)[#] Extension operators and subordination chains 15
 Hidetaka Hamada (Kyushu Sangyo Univ.)
 Gabriela Kohr (Babeş-Bolyai Univ.)

Summary: Since the work of Roper and Suffridge in 1995, there has been considerable interest in constructing holomorphic mappings of the unit ball in \mathbb{C}^n with various geometric properties (convexity, starlikeness, and spirallikeness) by using lower dimensional mappings with similar properties. It is also interesting to extend subordination chains. Recently M. Elin has introduced an approach to extension operators on Banach spaces based on semigroups which leads to an identification of some of the essential properties of such operators. In this talk, we adopt Elin’s point of view and give a theorem about the extension of subordination chains which extends and unifies existing results.

- 16 Satoru Shimizu (Tohoku Univ.) Diffeomorphisms between Siegel domains of the first kind preserving
 Akio Kodama (Kanazawa Univ.) the holomorphic automorphism groups and applications 15

Summary: In 2010, in the class of hyperbolic manifolds in the sense of Kobayashi, we obtained an intrinsic characterization of bounded symmetric domains by their automorphism groups. In connection with this, we give in this talk a structure theorem on diffeomorphisms between Siegel domains of the first kind that preserve the holomorphic automorphism groups. As an application, we obtain a well-known fact that two Siegel domains of the first kind are biholomorphically equivalent if and only if they are linearly equivalent.

13:15–14:15 Talk invited by Complex Analysis Section

- Hiroshi Yamaguchi (Shiga Univ.)[#] Pseudoconvex domains in the Hopf surface

Summary: Let $a \in \mathbb{C} \setminus \{0\}$ with $|a| > 1$ and let \mathbb{H}_a be the Hopf manifold with respect to a , i.e., $\mathbb{H}_a = \mathbb{C}^n \setminus \{0\} / \sim$ where $z' \sim z$ if and only if there exists $m \in \mathbb{Z}$ such that $z' = a^m z$ in $\mathbb{C}^n \setminus \{0\}$. In a previous paper with K-T. Kim, N. Levenberg in *Memoirs* in 2011 we showed that any pseudoconvex domain $D \subset \mathbb{H}_a$ with C^ω -smooth boundary which is not Stein is biholomorphic to $T_a \times D_0$ where D_0 is a Stein domain in \mathbb{P}^{n-1} with C^ω -smooth boundary and T_a is a one-dimensional torus. This was achieved using the technique of variation of domains in a complex Lie group developed in the previous paper applied to \mathbb{H}_a as a complex homogeneous space with transformation group $GL(n, \mathbb{C})$.

For $a, b \in \mathbb{C} \setminus \{0\}$ with $|b| \geq |a| > 1$ we let $\mathcal{H}_{(a,b)}$ be the Hopf surface with respect to (a, b) , i.e., $\mathcal{H}_{(a,b)} = \mathbb{C}^2 \setminus \{(0, 0)\} / \sim$, where $(z, w) \sim (z', w')$ if and only if there exists $n \in \mathbb{Z}$ such that $z' = a^n z, w' = b^n w$. In this work we characterize the pseudoconvex domains with C^ω -smooth boundary in $\mathcal{H}_{(a,b)}$ which are not Stein.

This is the joint work with N. Levenberg (cf: arXiv:1205.3346v1)

Functional Equations

September 18th (Tue) Conference Room III

9:00–12:00

- 1 Takashi Oyabu 10 talks including “Evolution equations of parabolic type” 5
- 2 Hidetoshi Tahara (Sophia Univ.)* Summability of formal solutions of some linear partial differential equations
Hiroshi Yamazawa tions 10
(Shibaura Inst. of Tech.)

Summary: We consider the Cauchy problem for linear partial differential equations with holomorphic coefficients in the complex domain. It is shown that if the Cauchy data are entire functions of exponential type of a suitable order, the problem has a formal solution which is multisummable in a suitable direction. The precise bound of the admissible order of the exponential type is calculated by using the Newton polygon of the equation.

- 3 Masashi Yamaguchi (Univ. of Tokyo)[#] Rigidity index and q -middle convolution of linear q -difference equations
Sakai Hidetaka (Univ. of Tokyo) 10

Summary: We consider $m \times m$ matrix system with rational coefficients $E_R : Y(qx) = R(x)Y(x)$. At first, we defined canonical form of E_R using gauge transformations. Next, we defined rigidity index of E_R . We expect that rigidity index and the number of accessory parameters are related. Moreover we defined q -convolution and q -middle convolution. q -convolution is recomposed analytical transformation using q analog of Euler transformation. We showed that q -middle convolution preserves Fuchsian type, irreducibility, and rigidity index in general case.

- 4 Yoko Umeta (Hokkaido Univ.)* Construction of general formal solutions for equations of the second
Painlevé hierarchy 10

Summary: We construct general formal solutions containing sufficiently many free parameters for equations of the second Painlevé hierarchy $(P_{II})_m$ with a large parameter by multiple-scale analysis. The solution constructed here is often called an instanton-type solution and it has the similar form as that of transseries solution. In this talk, we rewrite $(P_{II})_m$ in terms of generating functions and we explain multiple-scale analysis for $(P_{II})_m$ with generating functions.

- 5 Tomonari Sei (Keio Univ.)[#] Holonomic gradient descent for Fisher distribution on the rotation group
Akimichi Takemura (Univ. of Tokyo) $SO(3)$ 10
Katsuyoshi Ohara (Kanazawa Univ.)
Nobuki Takayama (Kobe Univ.)

Summary: We study properties of Fisher distribution on the rotation group $SO(3)$. It is known that the normalizing constant (the Fisher integral) of the distribution is expressed as a hypergeometric function with matrix argument. We apply the holonomic gradient descent, introduced by Nakayama et al., for evaluating the normalizing constant and for computing the maximum likelihood estimate.

6 Tamio Koyama (Kobe Univ./JST CREST) [#] The holonomic rank of the Fisher–Bingham system of differential equations 10
 Hiromasa Nakayama (Kobe Univ./JST CREST)
 Kenta Nishiyama (Osaka Univ./JST CREST)
 Nobuki Takayama (Kobe Univ./JST CREST)

Summary: The Fisher–Bingham system is a system of linear differential equations satisfied by the Fisher–Bingham integral for the n -dimensional sphere S^n . The system is given in [Nakayama et al. (2011), Theorem 2] and it is shown that it is a holonomic system [Koyama]. We show that the holonomic rank of the system is equal to $2n + 2$.

7 Mika Tanda (Kinki Univ.) [#] Borel sums of Voros coefficients and parametric Stokes phenomena for Takashi Aoki (Kinki Univ.) hypergeometric differential equations 10

Summary: Explicit forms of Voros coefficients and their Borel sums are given for hypergeometric differential equations with a large parameter. As an application, parametric Stokes phenomena are investigated for the equations.

8 Kana Ando (Chiba Univ.) ^{*} Numerical computation of Stokes multipliers 10

Summary: The Stokes phenomenon for a linear differential system with an irregular singularity at zero is the appearance of distinct sector-dependent analytic solutions that are asymptotic to a formal solution. To each anti-Stokes direction there is a Stokes matrix which is a meromorphic invariant for the system. The Stokes matrices are, in general, transcendental with respect to the coefficients of the differential system. As we do not have an algebraic method for finding the Stokes Multipliers, we turn to numerical manipulation of examples for insight. The aim of this talk is to show how to numerically compute the Stokes matrices by means of a recursion process in some simple cases. This is a joint work with M. Loday of Université d’Angers.

9 Shinji Sasaki (Kyoto Univ.) [#] On the Borel summability of WKB-theoretic transformation series concerning fixed singularities 10

Summary: We consider WKB-theoretic transformation of one-dimensional stationary Schrödinger equation. The transformation series to the Airy equation, which is the canonical equation of one having a simple turning point, was proved to be Borel summable under a suitable global condition on the coefficient function by S. Kamimoto and T. Koike. In this talk, we show that the transformation to the Weber equation, which is the canonical equation of one having a pair of simple turning points, is also Borel summable under a suitable condition. We note that the Airy equation is the simplest equation whose Borel transformed WKB solutions have so-called movable singularities, while the Weber equation is the one whose Borel transformed WKB solutions have fixed singularities.

10 Masafumi Yoshino (Hiroshima Univ.) [#] On connection problem of some Hamiltonian system 10

Summary: We will study the connection problem of n functionally independent commuting first integrals of an analytic-nonintegrable resonant Hamiltonian system with n degrees of freedom.

- 11 Hisashi Morioka (Univ. of Tsukuba)[#] A Rellich type theorem for discrete Schrödinger operators 10
 Hiroshi Isozaki (Univ. of Tsukuba)

Summary: An analogue of Rellich's theorem is derived for the discrete Laplacian on the square lattice, and applied to the unique continuation property on certain domain as well as non-existence of embedded eigenvalues for discrete Schrödinger operators.

- 12 Hironori Kumura (Shizuoka Univ.)^{*} Limiting absorption principle on manifolds having ends with various measure growth rate limits 10

Summary: The purpose of this talk is to state the property of the resolvent of the Laplace–Beltrami operator on a noncompact complete Riemannian manifold with various ends each of which has a different limit of the growth rate of the Riemannian measure at infinity, in particular, focusing on the limiting absorption principle. As a result, we will obtain the absolute continuity of the Laplace–Beltrami operator.

- 13 Haruya Mizutani (Kyoto Univ.)[#] On Strichartz estimates for Schrödinger equations with unbounded electromagnetic potentials 10

Summary: We consider Schrödinger equations with variable coefficients and unbounded electromagnetic potentials, where the kinetic energy part is a long-range perturbation of the flat Laplacian and the electric (resp. magnetic) potential can grow subquadratically (resp. sublinearly) at spatial infinity. We prove sharp (local-in-time) Strichartz estimates, outside a large compact ball centered at origin, for any admissible pair including the endpoint. Under the nontrapping condition on the Hamilton flow generated by the kinetic energy, global-in-space estimates are also studied.

- 14 Haruya Mizutani (Kyoto Univ.)[#] Remarks on Strichartz estimates for Schrödinger equations on manifolds with ends 10

Summary: We consider time-dependent Schrödinger equations on a class of non-compact manifolds with ends, where the volume density grows polynomially at infinity and is strictly larger than that of the Euclidean space. Under a convexity condition on the angular metric, which is weaker than usual asymptotic conditions, we prove local-in-time Strichartz estimates outside a large compact set. Under the nontrapping condition, global-in-space estimates are also studied.

14:15–16:15

- 15 Takehiro Nagaoka (Kyoto Univ.)[#] Asymptotic behavior of solutions of linear differential systems 10
 Yorimasa Oshime (Doshisha Univ.)

Summary: We consider extending the Levinson theorem for the asymptotic behavior of the solutions of linear differential systems, and we give the theorems including the alternative proof of the Levinson theorem. And also we give the similar theorem for the asymptotic behavior of the solutions of linear differential system with Jordan form in the coefficient matrix.

- 16 Hideaki Matsunaga (Osaka Pref. Univ.)[#] Formal adjoint operators and asymptotic formula for solutions of integral equations 10
 Satoru Murakami
 (Okayama Univ. of Sci.)
 Yutaka Nagabuchi
 (Okayama Univ. of Sci.)

Summary: For linear integral equations with infinite delay, we obtain an explicit asymptotic representation formula of solutions, developing the spectral analysis for the generator of solution semigroup as well as the one for the formal adjoint operator associated with the generator.

17 Jitsuro Sugie (Shimane Univ.)[#] Criteria for global asymptotic stability of damped superlinear oscillators
 Tsunehiko Shimadu (Shimane Univ.) 10
 Takashi Yamasaki (Shimane Univ.)

Summary: A necessary and sufficient condition is established for the equilibrium of the damped superlinear oscillator $x'' + a(t)\phi_q(x') + \omega^2x = 0$ to be globally asymptotically stable. The obtained criterion is judged by whether the integral of a particular solution of the first-order nonlinear differential equation $u' + \omega^{q-2}a(t)\phi_q(u) + 1 = 0$ is divergent or convergent. Since this nonlinear differential equation cannot be solved in general, it can be said that the presented result is expressed by an implicit condition. Explicit sufficient conditions and explicit necessary conditions are also given for the equilibrium of the damped superlinear oscillator to be globally attractive. Moreover, it is proved that a certain growth condition of $a(t)$ guarantees the global asymptotic stability for the equilibrium of the damped superlinear oscillator.

18 Kunihiko Taniguchi * Extinction in a two-species nonautonomous Lotka–Volterra competition
 (Mojigakuen Senior High School) system 10
 Hiroyuki Usami (Gifu Univ.)

Summary: We consider two-species nonautonomous Lotka–Volterra competition systems. Under certain conditions we show that one species goes to extinction and the other ones survive. Our results give generalizations of previous ones.

19 Shinji Adachi (Shizuoka Univ.) * Uniqueness and non-degeneracy of positive solutions for a class of
 Masataka Shibata (Tokyo Tech) quasilinear elliptic equations with general nonlinearities 10
 Tatsuya Watanabe
 (Kyoto Sangyo Univ.)

Summary: We study the asymptotic behavior of the ground state for a class of quasilinear Schrödinger equations with general nonlinearities. By the variational argument and dual approach, we show the asymptotic non-degeneracy and uniqueness of the ground state.

20 Naoki Sioji (Yokohama Nat. Univ.) * Radial symmetry of n -mode positive solutions for semilinear elliptic
 Kohtaro Watanabe equations in a disc and its applications to the Hénon equation 10
 (Nat. Defense Acad. of Japan)

Summary: We show the radial symmetry of n -mode positive solutions for semilinear elliptic equations in $D = \{x \in \mathbb{R}^2 : |x| < 1\}$, and we apply it to the Hénon equation $-\Delta u = |x|^\alpha |u|^{p-2}u$ in D with $u = 0$ on ∂D , where $\alpha, p > 2$. We show that if $m \geq 1 + \lceil \alpha/2 \rceil$ then each m -mode, positive solution of the Hénon equation is radially symmetric, and if p is large enough and $m \leq \lceil \alpha/2 \rceil$ then the equation has nonradial m -mode positive solution.

21 Ryuji Kajikiya (Saga Univ.) * Multiple bifurcations of solutions for one-dimensional p -Laplace equa-
 tion 10

Summary: In this lecture, we study one-dimensional p -Laplace equation. We prove that infinite bifurcations occur at a single point and show the existence and multiplicity of sign-changing solutions.

22 Ryuji Kajikiya (Saga Univ.) * Least energy solutions of the Hénon equation in point symmetric or
 reflectionally symmetric domains 10

Summary: We study the generalized Hénon equation in point symmetric or reflectionally symmetric domains and prove that a least energy solution is neither even nor reflectionally symmetric.

- 23 Ryuji Kajikiya (Saga Univ.)* Asymmetry of solutions for the Hénon equation in general symmetric domains 10

Summary: We study the generalized Hénon equation in symmetric bounded domains, where the equation is invariant under the action of a closed subgroup of the orthogonal group. We prove that a least energy solution is not invariant under the group action.

16:30–17:30 Talk invited by Functional Equations Section

- Satoshi Tanaka (Okayama Univ. of Sci.)[#] Nonuniqueness of positive solutions of superlinear two-point boundary value problems —Symmetry-breaking of even positive solutions—

Summary: The following two-point boundary value problem $u'' + h(x)f(u) = 0$, $x \in (-1, 1)$, $u(-1) = u(1) = 0$ is considered, where $h \in C[-1, 1] \cup C^1([-1, 1] \setminus \{0\})$, $h(x) > 0$, $h(-x) = h(x)$ on $[-1, 1] \setminus \{0\}$, $f \in C^1[0, \infty)$, $f(s) > 0$ for $s > 0$, and $f(0) = 0$. The problem for the one-dimensional Hénon equation $u'' + |x|^l u^p = 0$, $x \in (-1, 1)$, $u(-1) = u(1) = 0$ is a typical example, where $l \geq 0$ and $p > 1$. This problem always has the positive even solution and it is unique. It is well-known that if $l = 0$ then, there is no positive non-even solution, and if $l > 0$ is sufficiently large, then there exist positive non-even solutions, and symmetry-breaking phenomena occur. In this talk, new symmetry-breaking results, by studying the Morse index of the positive even solution, are introduced.

September 19th (Wed) Conference Room III

9:00–12:00

- 24 Toru Kan (Tohoku Univ.)* On non-radially symmetric solutions of the Liouville–Gel’fand equation on a two-dimensional annular domain 10

Summary: We consider the Liouville–Gel’fand equation on a two-dimensional annular domain. It is known that non-radially symmetric solutions appear through a bifurcation from radially symmetric solutions. Our concern is the global structure of the bifurcating non-radially symmetric solutions in a bifurcation diagram. To this end we deal with the case where the inside radius of the domain is sufficiently small. We construct approximate solutions by the method of matched asymptotic expansions and obtain non-radially symmetric solutions by the contraction mapping principle.

- 25 Mieko Tanaka (Tokyo Univ. of Sci.)* The antimaximum principle and the existence of a solution for the generalized p -Laplace equations with indefinite weight 10

Summary: In this talk, I talk the antimaximum principle and the existence of a solution for quasilinear elliptic equation $-\operatorname{div} (a(x, |\nabla u|)\nabla u) = \lambda m(x)|u|^{p-2}u + h(x)$ in Ω under the Neumann boundary condition, where we admit that a weight function m changes sign. This equation contains the p -Laplacian problem as a special case.

- 26 Mieko Tanaka (Tokyo Univ. of Sci.)* Multiple existence results of solutions for quasilinear elliptic equations
 Dumitru Motreanu (Univ. de Perpignan) with a nonlinearity depending on a parameter 10

Summary: I talk existence results of multiple solutions for quasilinear elliptic equations depending on a parameter under the Neumann and Dirichlet boundary condition. Our main result shows the existence of two opposite constant sign solutions and a sign changing solution in the case where we do not impose the subcritical growth condition to the nonlinear term. The studied equations contain the p -Laplacian problems as a special case. Our approach is based on variational methods combining super- and sub-solution and the existence of critical points via descending flow.

- 27 Tetsutaro Shibata (Hiroshima Univ.)* Critical exponents of the asymptotic formulas for two-parameter variational eigencurves 10

Summary: We consider the two-parameter nonlinear eigenvalue problem and establish the precise asymptotic formulas for the variational eigencurve $\lambda = \lambda(\mu)$, which is defined on general level set, as $\mu \rightarrow \infty$. Especially, we obtain new critical exponents $p = 7/5, 5/3, 2, 3, 5$ from a viewpoint of the asymptotics of the eigencurve $\lambda(\mu)$.

- 28 Futoshi Takahashi (Osaka City Univ.)# On the number of maximum points of least energy solution to a two-dimensional Hénon equation with large exponent 10

Summary: We prove that least energy solutions of the two-dimensional Hénon equation with large exponent have only one global maximum point when the parameter involved is in some range and the nonlinear exponent is sufficiently large. This answers positively to a recent conjecture by C. Zhao.

- 29 Shuichi Jimbo (Hokkaido Univ.)# Regular domain variation and electromagnetic frequencies 10

Summary: An harmonic oscillation in Maxwell equation in a bounded domain is described by an eigenvalue problem of a certain elliptic operator. A variational formula for the eigenvalue under a regular domain perturbation is presented.

- 30 Yasuhito Miyamoto (Keio Univ.)# Global branches of sign-changing solutions to a semilinear Dirichlet problem in a disk 10

Summary: We study sign-changing solutions to a Neumann problem in a disk under the conditions $f(0) = 0$ and $f'(0) = 1$ in the viewpoint of the bifurcation theory. We show that this problem has infinitely many bifurcation points from which unbounded continua of sign-changing solutions emanate, where the eigenfunctions corresponding to each bifurcation point are nonradially symmetric. When $f(u)$ is of Allen–Cahn type (e.g., $f(u) = u - u^3$), then we show that the maximal continuum emanating from the second eigenvalue is homeomorphic to $\mathbf{R} \times S^1$.

- 31 Yasuhito Miyamoto (Keio Univ.)# A planar convex domain with many isolated hot spots on the boundary 10

Summary: We construct a planar convex domain where the second Neumann eigenfunction has many isolated local maximum points, which are called “hot spots”, on the boundary. This result indicates that it is impossible to characterize the shape of the second Neumann eigenfunction by the number of the local maximum points on the boundary. We also show that the “hot spots” conjecture holds for all isosceles triangles.

32 Goro Akagi (Kobe Univ.)[#] Symmetry and stability of asymptotic profiles for fast diffusion equations
 Ryuji Kajikiya (Saga Univ.) 10

Summary: This talk is concerned with a stability analysis of asymptotic profiles of vanishing solutions to the Cauchy–Dirichlet problems for fast diffusion equations in annular domains.

33 Goro Akagi (Kobe Univ.)[#] Symmetry breaking of least energy solutions of Emden–Fowler equations
 Ryuji Kajikiya (Saga Univ.) 10

Summary: In this talk, we report a couple of results on some symmetry breaking of least energy solutions and the existence of partially symmetric solutions to the Dirichlet problem for Emden–Fowler equations in annular domains.

34 Yuki Kaneko (Waseda Univ.)[#] A free boundary problem related to an ecological model in multi-dimensional annulus
 Yoshio Yamada (Waseda Univ.) 10

Summary: We consider free boundary problems for reaction-diffusion equations modeling the spreading of species, where unknown functions are population density and spreading front of species. The dynamical behavior of the free boundary is determined by Stefan-like condition. Such model was first proposed by Du and Lin (2010) in case of space dimension one. We show the global existence and uniqueness of radially symmetric solutions of the free boundary problem in multi-dimensional annulus and their asymptotic behaviors. In particular, spreading and vanishing of species are discussed. For this purpose, we construct an energy identity and also use the comparison principle.

35 Kazuhiro Oeda (Waseda Univ.)^{*} Stationary solutions for a prey-predator model with nonlinear diffusion and a protection zone 10

Summary: We consider a prey-predator model with nonlinear diffusion and a protection zone for the prey species. We discuss the existence and non-existence of positive stationary solutions by using the bifurcation theory. We also study the asymptotic behavior of positive stationary solutions as the growth rate of the predator species tends to infinity. From an ecological viewpoint, a positive stationary solution means a coexistence state of prey and predator.

36 Yan-Yu Chen (Meiji Univ.)[#] Existence and uniqueness of rigidly rotating spiral waves by a wave front interaction model
 Jong-Shenq Guo (Tamkang Univ.)
 Hirokazu Ninomiya (Meiji Univ.) 10

Summary: In this work, we study the rotating spiral waves by wave front interaction model proposed by Zykov in 2007. The main result we derive as follows.

- (1) Show the global existence of the back.
- (2) Asymptotic behavior of the solution at infinity.
- (3) Prove the uniqueness of the back.

From the above, we succeed to show the spiral waves as a thick region.

- 37 Keisuke Takasao (Hokkaido Univ.)* Yoshihiro Tonegawa (Hokkaido Univ.) The existence of the weak solution for mean curvature flow with transport term 10

Summary: In this talk we consider the mean curvature flow with transport term. In 1978, Brakke proved the existence of weak solutions defined by using geometric measure theory, for the mean curvature flow. The weak solution is called Brakke’s mean curvature flow. In 1991, Chen, Giga and Goto, and Evans and Spruck proved the existence of the viscosity solutions of the mean curvature flow at the same time. In 2010, Liu, Sato and Tonegawa proved that there exists Brakke’s mean curvature flow with transport term when $n = 2, 3$ by using the phase field method. We extended the existence theorem for any dimension by using Huisken’s monotonicity formula.

- 38 Masashi Mizuno (Nihon Univ.)* Yoshihiro Tonegawa (Hokkaido Univ.) Boundary monotonicity formula for the Allen–Cahn equation with Neumann boundary condition 10

Summary: We consider the singular limiting problem of the Allen–Cahn equation with Neumann boundary condition. It is well-known that this problem is closely related to the mean curvature flow. Huisken’s monotonicity formula plays an important role to study the regularity theory for the mean curvature flow. We obtain Huisken’s monotonicity formula for the Allen–Cahn equation at the boundary.

13:15–14:15 Talk invited by Functional Equations Section

- Naoto Kumano-go (Kogakuin Univ.)[‡] Phase space path integrals as analysis on path space

Summary: We give two general classes of functionals for which the phase space Feynman path integrals have a mathematically rigorous meaning. More precisely, for any functional belonging to each class, the time slicing approximation of the phase space path integral converges uniformly on compact subsets with respect to the starting point of momentum paths and the endpoint of position paths. Each class is closed under addition, multiplication, translation, real linear transformation and functional differentiation. Therefore, we can produce many functionals which are phase space path integrable. Furthermore, though we need to pay attention for use, the interchange of the order with the integrals with respect to time, the interchange of the order with some limits, the semiclassical approximation of Hamiltonian type, the natural property under translation, the integration by parts with respect to functional differentiation, and the natural property under orthogonal transformation are valid in the phase space path integrals.

September 20th (Thu) Conference Room III

9:00–12:00

- 39 Michiaki Onodera (Tohoku Univ.)[‡] A variational problem and a related geometric evolution equation 10

Summary: In this talk we introduce a geometric evolution equation which is related to a variational problem arising in the classical potential theory. Here, the variational problem is to minimize a functional with a variable domain of integration in a certain function space. The corresponding Euler–Lagrange equation naturally appears in a classical physical context and it is related to the mean value property of harmonic functions. A new approach to the investigation of the Euler–Lagrange equation by using the evolution equation is proposed. In fact, we prove that our geometric evolution equation produces solutions to a one-parameter family of the Euler–Lagrange equations.

- 40 Aya Ishizeki (Saitama Univ.)* The removability of singularity of density and the absolute integrability
 Takeyuki Nagasawa (Saitama Univ.) of variational formulae for Möbius energy 10

Summary: Since the Möbius energy is defined so that its value diverges when a knot has a self-intersection, its energy density has singularity. In addition to the self-intersection, “diagonal part” induces the singularity. In this talk the removability of singularity at diagonal part is shown. This yields the absolute integrability of the first and second variational formulae.

- 41 Sachiko Ishida (Tokyo Univ. of Sci.)# Possibility of the blow-up in quasilinear degenerate Keller–Segel systems
 Takashi Ono 10
 (Tokyo Jitsugyo High School)
 Tomomi Yokota (Tokyo Univ. of Sci.)

Summary: We consider the blowing up to quasilinear degenerate Keller–Segel systems of parabolic-parabolic type. In the ‘non-degenerate’ case, Winkler (2010) constructed the initial data such that the solution blows up in either finite or infinite time. However, the blow-up under the super-critical condition is left as an open question in the ‘degenerate’ case. In this talk, we try to give an answer to the question under assuming the existence of time-in-local strong solutions.

- 42 Takashi Suzuki (Osaka Univ.)# Exclusion of boundary blowup for 2D chemotaxis system provided with
 Dirichlet boundary condition for the Poisson part 10

Summary: We study a chemotaxis system on bounded domain in two dimensions where the formation of chemical potential is subject to the Dirichlet boundary condition. For such a system the solution is kept bounded near the boundary and hence the blowup set is composed of a finite number of interior points. If the initial total mass is critical and the domain is close to a disc then the solution exhibits a collapse in infinite time of which movement is subject to a gradient of the Robin function.

- 43 Masahiko Shimojo (Hokkaido Univ.)# Control of blow-up set by spatial inhomogeneous coefficient for a semi-
 Jong-Shenq Guo (Tamkang Univ.) linear parabolic equation 10
 Yung-Jen Lin Guo
 (Nat. Taiwan Normal Univ.)
 Chang-Shou Lin (Nat. Taiwan Univ.)

Summary: We study the blow-up behavior for positive solutions of a reaction-diffusion equation with non-negative spatial variable coefficient which has zero points. We first show that any point with zero source can not be a blow-up point under certain conditions. And we also derive the blow-up rate and the local profile of such blow-up points. On the other hand, we are able to construct a solution that blows up at some zero point of spatial variable coefficient.

- 44 Kazushige Nakagawa (Tohoku Univ.)* The Phragmén–Lindelöf theorem of fully nonlinear systems for L^p -vis-
 cosity solutions with unbounded ingredients 10

Summary: The Phragmén–Lindelöf theorem is established for L^p -viscosity solutions of fully nonlinear elliptic systems with first-order terms having linear growth and unbounded coefficients.

- 45 Hiroyoshi Mitake (Fukuoka Univ.)* On the large time behavior of solutions of Hamilton–Jacobi equations
 Hitoshi Ishii (Waseda Univ.) associated with nonlinear boundary conditions 10
 Guy Barles (Univ. de Tours)

Summary: In this article, we study the large time behavior of solutions of first-order Hamilton–Jacobi equations, set in a bounded domain with nonlinear Neumann boundary conditions, including the case of dynamical boundary conditions. We establish general convergence results for viscosity solutions of these Cauchy–Neumann problems by using two fairly different methods: the first one relies only on partial differential equations methods, which provides results even when the Hamiltonians are not convex, and the second one is an optimal control/dynamical system approach, named the “weak KAM approach” which requires the convexity of Hamiltonians and gives formulas for asymptotic solutions based on Aubry–Mather sets.

- 46 Hiroyoshi Mitake (Fukuoka Univ.)* Remarks on the large time behavior of viscosity solutions of quasi-
 Hung Vinh Tran (UC, Berkeley) monotone weakly coupled systems of Hamilton–Jacobi equations 10

Summary: We investigate the large-time behavior of viscosity solutions of quasi-monotone weakly coupled systems of Hamilton–Jacobi equations on the n -dimensional torus. We establish a convergence result to asymptotic solutions as time goes to infinity under rather restricted assumptions.

- 47 Atsushi Nakayasu (Univ. of Tokyo)* Eikonal equations in metric spaces 10
 Yoshikazu Giga (Univ. of Tokyo)
 Nao Hamamuki (Univ. of Tokyo)

Summary: We extend the notion of a viscosity solution to Eikonal equations defined on a metric space. This extension is expected to be useful for considering propagation on social networks. In this talk we first study a differential for functions on a metric space and introduce a notion of a solution for the equation. We show that a comparison theorem holds as the classical theory. The existence of a solution for a boundary value problem is established by constructing the value function of the optimal control theory. The consistency with the classical viscosity solutions in a Euclidean space is also studied.

- 48 Gen Nakamura (Hokkaido Univ.)[#] Linear sampling method for identifying cavities in a heat conductor
 Haibing Wang (Hokkaido Univ.) 10

Summary: We consider an inverse problem of identifying the unknown cavities in a heat conductor. Using the Neumann-to-Dirichlet map as measured data, we develop a linear sampling type method for the heat equation. A new feature is that there is a freedom to choose the time variable, which suggests that we have more data than the linear sampling methods for the inverse boundary value problem associated with EIT and inverse scattering problem with near field data.

- 49 Junichi Harada (Waseda Univ.)* Some blow-up solutions of the heat equation with nonlinear boundary
 conditions 10

Summary: We study finite time blow-up solutions of the heat equations with nonlinear boundary conditions. We discuss the existence of blow-up solutions whose asymptotic behavior is not described by the self-similar solutions.

- 50 Yusuke Yamauchi (Waseda Univ.)* Life span of positive solutions for the Cauchy problem for the parabolic equations 10

Summary: Since 1960's, the blow-up phenomena for the semilinear heat equation have been by many researchers. In this talk, we discuss the upper bound of the life span of positive solutions of the semilinear heat equation for initial data having positive limit inferior at space infinity. The proof is based on a slight modification of Kaplan's method. This argument is also applicable to some oscillating initial data and to some system of semilinear heat equations.

- 51 Masakazu Yamamoto (Hiroasaki Univ.)* Asymptotic behavior of solutions to the dissipative equation with anomalous diffusion 10

Summary: The Cauchy problem for the linear dissipative equation with a potential is studied. The dissipative effect of this equation is given by the fractional Laplacian. The main goal is to derive the asymptotic expansion of solutions.

- 52 Michiyuki Watanabe (Niigata Univ.)* Inverse scattering at fixed amplitude for nonlinear Schrödinger equations 10

Summary: We consider the inverse scattering problem for nonlinear Schrödinger equations. In this talk, it will be shown that the nonlinear exponent and the coefficient of the nonlinear term are uniquely reconstructed from the scattering operator.

- 53 Tomoyuki Niizato (Osaka Univ.)* The decay rates of solutions to the non-linear dissipative-dispersive wave equations 10

Summary: We study the Cauchy problem for the non-linear dissipative-dispersive wave equations: $\partial_t u + |D|^\alpha \partial_x u - \partial_x^2 u = -\partial_x(u^2)$. We prove that if the initial data $u_0 \in \mathbf{H}^1 \cap \mathbf{L}^1$ then there exists a unique solution $u \in \mathbf{C}([0, \infty); \mathbf{H}^1)$ to the non-linear dissipative-dispersive wave equations. Moreover if $\frac{19}{10} < \alpha < 6$ then the following time decay estimate is true: $\|u(t)\|_{\mathbf{L}^2} \leq C(1+t)^{-\frac{1}{4}}$.

14:15–16:15

- 54 Yoshihisa Nakamura (Kumamoto Univ.)* Large time behavior of small solutions to multi-component nonlinear Schrödinger equations 10
 Naoyasu Kita (Univ. of Miyazaki)

Summary: We study the asymptotic behavior of the solutions to the Cauchy problem of nonlinear Schrödinger equations, in which the unknown function takes matrix values. The nonlinearity is of gauge-invariant cubic type. We present a result on the decay estimate of small data solutions, which tells us the non-existence of small soliton. In addition, we observe that the solution asymptotically tends to a modified free evolution.

- 55 Kota Uriya (Tohoku Univ.)* Asymptotic behavior of a solution to a nonlinear Schrödinger system
 Takayoshi Ogawa (Tohoku Univ.) 10

Summary: We are concerned with the asymptotic behavior of a quadratic nonlinear Schrödinger system in two space dimensions. Our aim is to show the existence of modified wave operators for the system under the resonance mass condition. We introduce a new angular modification to remove the influence of a resonance term.

- 56 Hironobu Sasaki (Chiba Univ.)* Scattering problems for the one-dimensional nonlinear Dirac equation with power nonlinearity 10

Summary: We study scattering problems for the one-dimensional nonlinear Dirac equation. We prove that if $p > 3$ (resp. $p > 3 + 1/6$), then the wave operator (resp. the scattering operator) is well-defined on some 0-neighborhood of a weighted Sobolev space.

- 57 Toshiyuki Suzuki (Tokyo Univ. of Sci.)[#] Energy methods for Hartree type equations with inverse-square potentials 10

Summary: Nonlinear Schrödinger equations with nonlocal nonlinearities described by integral operators are considered. This generalizes usual Hartree type equations (HE). We construct weak solutions to (HE) even if the kernel is of non-convolution type by employing energy methods as recently developed in Okazawa–Suzuki–Yokota (preprint). The advantage of the methods is the applicability to the problem with strongly singular potential $|x|^{-2}$ as a term in the linear part and critical nonlinearity.

- 58 Masahiro Ikeda (Osaka Univ.)[#] Remark on nonrelativistic limit for nonlinear Klein–Gordon system with Yuta Wakasugi (Osaka Univ.) mass resonance 10

Summary: We consider the non-relativistic limit for a solution of a nonlinear Klein–Gordon system with mass resonance condition. In this talk, we will prove that the solution for the Klein–Gordon system with mass resonance converges a solution for a nonlinear Schrodinger system in energy space as the speed of light tends to infinity.

- 59 Nakao Hayashi (Osaka Univ.)* Asymptotic behavior of solutions to nonlinear Klein–Gordon equations in 1d 10

Summary: We consider asymptotic behavior of solutions to the initial value problem for the quadratic nonlinear Klein–Gordon equation in one space dimension when the data are the real-valued functions and small in suitable Sobolev spaces. Using the method of normal forms of Shatah we show a sharp asymptotic behavior of small solutions without the condition of a compact support on the initial data which was assumed in the previous work by Delort.

- 60 Norihisa Ikoma (Tohoku Univ.)* On compactness of minimizing sequences for some nonlinear Schrödinger system 10

Summary: In this talk, we present the compactness of minimizing sequence related to some nonlinear Schrödinger system appeared in nonlinear optics. The minimizing problem has two constrained conditions (masses) and we minimize the energy functional. We discuss whether or not any minimizing sequence is relatively compact after suitable translations. As a corollary to the compactness of every minimizing sequence, we can obtain the orbital stability of the set of all minimizers. A key of proof is to establish a strict inequality which excludes a possibility of dichotomies.

- 61 Yohei Yamazaki (Kyoto Univ.)[#] Transverse instability for a system of nonlinear Schrödinger equations 10

Summary: We consider the transverse instability for a system of nonlinear Schrödinger equations on the real line times torus with the $2\pi L$ period. This system is a simplified model of the Raman amplification in a plasma and studied by Colin-Ohta. We know that this system on the real line has a stable standing wave. Here, we regard this standing wave as the standing wave of this system on the real line times torus with the $2\pi L$ period. Then we show that, there exists positive constant L_ω satisfying the following two conditions. If L is smaller than L_ω , then the standing wave is stable. If L is larger than L_ω , then the standing wave is unstable.

- 62 Satoshi Masaki (Gakushuin Univ.)[#] On minimal non-scattering solution for L^2 subcritical nonlinear Schrödinger equation. 10

Summary: We consider time global behavior of solutions to L^2 subcritical focusing nonlinear Schrödinger equation in framework of weighted L^2 space. We prove that there exists an initial data such that (i) corresponding solution does not scatter; (ii) with respect to a certain scale-invariant quantity, this attains minimum value in all non-scattering data. In mass-critical and -supercritical cases, it is known that the ground states are this kind of critical solutions. However, in this case, we can show that this initial data does NOT correspond to a standing wave solution such as ground state or excited state.

- 63 Shingo Ito (Tokyo Univ. of Sci.)^{*} Estimates on modulation spaces for Schroedinger evolution operators
 Keiichi Kato (Tokyo Univ. of Sci.) with a potential 10
 Masaharu Kobayashi (Yamagata Univ.)

Summary: By the wave packet transform with proper window function depending a time variable, we can transform the time dependent Schroedinger equation with a potential into some first order partial differential equation and lower order term. Using this method, we give new estimates for the solution to the time dependent Schroedinger equation with a potential in the framework of Modulation spaces.

16:30–17:30 Talk invited by Functional Equations Section

- Katsuyuki Ishii (Kobe Univ.)[#] Mathematical analysis of some algorithms for mean curvature flow

Summary: Let $\Gamma(t)$ ($t \geq 0$) be a family of hypersurfaces in \mathbb{R}^N ($N \geq 2$). We say that this family is a mean curvature flow (MCF for short) provided that $\Gamma(t)$ evolves by the equation: $V = -\text{div } \mathbf{n}$ on $\Gamma(t)$, ($t \geq 0$). Here \mathbf{n} is the outer unit normal vector of $\Gamma(t)$, V is the velocity of $\Gamma(t)$ in the direction to \mathbf{n} , and $-\text{div } n$ denotes the $((N - 1)$ -times) mean curvature of $\Gamma(t)$. The mean curvature flow equation arises from various fields such as material sciences, phase transition, mathematical biology, image processing and many other area. Hence many people have been studying MCF from the viewpoints of theories and applications. Numerical analysis for MCF has also been vigorously studied. As for numerical computations for MCF, the approximation by the Allen - Cahn equation is well known and there are many studies on the convergence and the error estimate. In the case $N = 2$, the boundary tracking method and the crystalline algorithm are studied. In this talk I would like to introduce some mathematical analysis and recent developments to an algorithm for MCF different from the above ones. We mainly treat the compact case in this talk and the results also hold in the noncompact case.

September 21st (Fri) Conference Room III

9:00–12:00

- 64 Ryosuke Hyakuna (Waseda Univ.)* On global solutions to the nonlinear Schrödinger equation with L^p -initial data 10

Summary: We prove local well-posedness of the Cauchy problem for the nonlinear Schrödinger equation $iu_t + u_{xx} \pm |u|^{\alpha-1}u = 0$, $u(0, x) = u_0(x)$ with $u_0 \in \widehat{L}^p(\mathbb{R})$, when p lies in an open neighborhood of 2. Moreover, we prove that the local solutions can be extended globally if p is close enough to 2.

- 65 Tsukasa Iwabuchi (Chuo Univ.)* Ill-posedness for the nonlinear Schrödinger equations in one and two
Takayoshi Ogawa (Tohoku Univ.) space dimensions 10

Summary: We consider the ill-posedness issue for the nonlinear Schrödinger equations with a quadratic nonlinearity by showing that the continuous dependence on initial data does not hold generally. In two space dimensions, Bejenaru–Silva showed the well-posedness in the Sobolev spaces $H^s(\mathbb{R}^2)$ ($s > -1$) and we consider the case $s \leq -1$ to show the ill-posedness. In one space dimension, Bejenaru–Tao showed that the regularity $s = -1$ is critical on the study in $H^s(\mathbb{R})$, and we show the ill-posedness in the Besov spaces $B_{2,q}^{-1}(\mathbb{R})$ ($q > 2$).

- 66 Mamoru Okamoto (Kyoto Univ.)# Well-posedness of the Cauchy problem for the Chern–Simons–Dirac system 10

Summary: We consider the Cauchy problem for the Chern–Simons–Dirac system on \mathbb{R}^{1+2} with initial data in $H^s \times H^r$. In two dimensional case, Huh shows that the initial value problem has a local unique solution which belongs to $C_T(H^{5/8}) \times C_T(H^{1/2})$. In this talk, we show local well-posedness for $H^s \times H^r$ data with $s = r > 3/4$. We also show that the data-to-solution map fails to be twice differentiable when $r < 3/4$ or $r > s$. Moreover, using the fact that the curvatures of the CSD system are determined by the spinor, we give local well-posedness with the spinor data in $H^{1/2+}$.

- 67 Shuji Machihara (Saitama Univ.)# Time global solutions in L^p for Chern–Simons–Dirac equation in 1 + 1
Takayoshi Ogawa (Tohoku Univ.) dimension 10

Summary: We consider the time global solutions for Chern–Simons–Dirac equation in 1 + 1 dimension. There are some available results of this problem by using H^s spaces. We use L^p spaces to obtain the solutions. In the critical case L^1 , we have to show that the solutions never shrink at any point for global time. This is a joint work with Takayoshi Ogawa (Tohoku University).

- 68 Takamori Kato (Kyoto Univ.)# Unconditional well-posedness of the fifth order modified KdV equation
Kotaro Tsugawa (Nagoya Univ.) with periodic boundary condition 10

Summary: We consider the well-posedness of the Cauchy problem for the fifth order modified KdV equation in the periodic setting. This equation is a complete integrability. While the nonlinear terms of this equation have three derivatives, the Fourier restriction norm method enables us to recover only at most two derivatives. To overcome this difficulty, we apply two conservation laws and the normal form method so that derivative losses of the nonlinear terms can be cancelled. Since the nonlinear terms can be controlled by only the Sobolev embedding theorem, we show the local well-posedness in $C([0, T]; H^s(\mathbb{T}))$ without using any auxiliary function space when $s > 3/2$.

- 69 Eiji Onodera (Kochi Univ.)* A fourth-order dispersive flow into Kähler manifolds 10
 Hiroyuki Chihara (Kagoshima Univ.)

Summary: We consider the initial value problem for a fourth-order dispersive flow equation for maps from the real line into compact Kähler manifolds, as a generalization of some classical S^2 -valued physical models. We show the existence and uniqueness of a time-local solution to the initial value problem. The idea of the proof is based on a gauge transformation acting on the pullback bundle to make use of the local smoothing effect of the fourth order dispersive equation on the real line.

- 70 Eiji Onodera (Kochi Univ.)* A fourth-order dispersive flow for closed curves on compact Riemann surfaces 10

Summary: We reconsider the initial value problem for the fourth-order dispersive flow equation discussed in the previous talk for maps from the one-dimensional flat torus into a compact Riemann surface. The previous method using the local smoothing effect on the real line essentially is no longer valid to solve the initial value problem in the torus case, since the torus is compact. We study the structure of the equation as a PDE systems in more detail, which results in the short time existence of the solution under a certain curvature condition on the Riemann surface.

- 71 Jun-ichi Segata (Tohoku Univ.)* Well-posedness for the fourth order nonlinear Schrödinger type equation on torus 10

Summary: We consider the time local and global well-posedness for the fourth order nonlinear Schrödinger type equation (4NLS) on the torus. The nonlinear term of (4NLS) contains the derivatives of unknown function and this prevents us to apply the classical energy method. To overcome this difficulty, we introduce the modified energy and derive an a priori estimate for the solution to (4NLS).

- 72 Yusuke Sugiyama (Tokyo Univ. of Sci.)[#] Global solvability for some quasilinear wave equation in one space dimension 10

Summary: Under some conditions on the initial data, we show the global existence of solutions of the Cauchy problem of the quasilinear wave equation: $\partial_t^2 u = c(u)^2 \partial_x^2 u + \lambda c(u) c'(u) (\partial_x u)^2$ for $0 \leq \lambda \leq 2$, which has richly physical background. P. Zheng and Y. Zhang show the global existence of solutions to this equation with $\lambda = 1$. It is difficult to apply their method to the global existence problem of this equation with $\lambda = 0$ directly. Furthermore, we study the large time behavior of solutions to this equation for $0 < \lambda < 2$.

- 73 Hideo Kubo (Tohoku Univ.)[#] Existence and blow-up of solutions to nonlinear wave equations in one
 Ayako Osaka (Tohoku Univ.) space dimension 10
 Muhammet Yazici (Tohoku Univ.)

Summary: This talk is concerned with the initial value problem for nonlinear wave equations in one space dimension. We shall characterize global behavior of solutions to the problem.

- 74 Hiroyuki Takamura (Future Univ.-Hakodate) * The lifespan of solutions of a nonlinear wave equations with a quadratic term of non-single and indefinite sign in four space dimensions 10
 Kyouhei Wakasa (Future Univ.-Hakodate)

Summary: The final problem on the optimality for the general theory of the fully nonlinear wave equations was solved by our previous work (J. Differential Equations, 2011). Such a result is achieved by so-called “almost global solution” of a semilinear equation with a single and positive quadratic term in four space dimensions. In this talk, I would like to show you another equation with a special quadratic term of non-single and indefinite sign which also admits an almost global solution.

- 75 Erika Ushikoshi (Tohoku Univ.)* Hadamard variational formula for the Green function for the velocity and pressure of the Stokes equations with the Dirichlet boundary condition 10

Summary: We consider the Hadamard variational formula for the Green function of the Stokes equations which describes the motion of the incompressible fluids moving slowly in the bounded domain with the smooth boundary. Under such a perturbation of the domain as keeping the topological type and as preserving the volume, we not only refine the proof of its formula for the velocity but also new formula for the pressure. Our result may be regarded as the Hadamard variational formula for the Green functions as an example of the elliptic system of equations with the Dirichlet boundary condition.

- 76 Ken Abe (Univ. of Tokyo)* The L^∞ -Stokes semigroup in exterior domains 10
 Yoshikazu Giga (Univ. of Tokyo)

Summary: The Stokes semigroup is extended to an analytic semigroup in spaces of bounded functions in an exterior domain with C^3 boundary. We handle initial data non-decaying at the space infinity. For such a non-decaying initial data even existence of solution is non-trivial. To show the unique existence of a solution we appeal to a priori estimates derived from a blow-up argument which is an indirect argument to obtain an a priori upper bound for solutions. We verify a sufficient condition to apply the a priori estimates and construct approximate initial sequence for non-decaying initial data.

- 77 Hirokazu Saito (Waseda Univ.)[#] On the L_p - L_q maximal regularity of the Neumann–Dirichlet problem for the Stokes equations in an infinite layer 10

Summary: In this talk, I would like to consider the L_p - L_q maximal regularity of the Stokes problem with Neumann–Dirichlet-type boundary condition in an infinite layer. This is a linearized problem of a free surface problem which is called the ocean problem. The free boundary problem in L_2 - L_2 framework is considered by Beale and Nishida. They proved a unique existence of its global solution and its decay properties. We need the L_p - L_q maximal regularity of the Stokes problem in order to deal with the free boundary problem in L_p - L_q -framework. In view of this, I will report the L_p - L_q maximal regularity of the Stokes problem.

- 78 Miho Murata (Waseda Univ.)[#] On the sectorial \mathcal{R} -boundedness of the Stokes operator for the compressible viscous fluid flow 10
 Yoshihiro Shibata (Waseda Univ.)

Summary: We consider the maximal L_p - L_q regularity and the generation of analytic semigroup for the compressible viscous fluid flow in a general domain with slip boundary condition. The key of the proof of maximal L_p - L_q regularity and the generation of analytic semigroup is to consider the sectorial \mathcal{R} -boundedness of the Stokes operator for the corresponding resolvent problem. Therefore in this talk, we mainly would like to report the sectorial \mathcal{R} -boundedness of the Stokes operator.

14:15–16:30

- 79 Tomoyuki Nakatsuka (Nagoya Univ.)^{*} Uniqueness of steady Navier–Stokes flows in exterior domains 10

Summary: We consider the uniqueness of stationary solutions to the Navier–Stokes equation in 3-dimensional exterior domains within the class $u \in L_{3,\infty}$ with $\nabla u \in L_{3/2,\infty}$, where $L_{3,\infty}$ and $L_{3/2,\infty}$ are the Lorentz spaces. It is shown that if solutions u and v satisfy the conditions that $v \in L_p$ for some $p > 3$ and u is small in $L_{3,\infty}$, then $u = v$. The proof relies upon the regularity theory for the perturbed Stokes equations and bootstrap argument.

- 80 Hajime Koba (Univ. of Tokyo)^{*} Nonlinear stability of Ekman boundary layers in rotating stratified fluids 10

Summary: We construct stationary solutions of the rotating Navier–Stokes–Boussinesq equations with stratification effects. We call such stationary solutions Ekman layers. We show the existence of a weak solution to an Ekman perturbed system, which satisfies the asymptotic stability.

- 81 Tsukasa Iwabuchi (Chuo Univ.)^{*} Time periodic solutions to the Navier–Stokes equations in the rotational
 Ryo Takada (Kyoto Univ.) framework 10

Summary: We consider the Navier–Stokes equations in the rotational framework with the time periodic external force. We give sufficient conditions on the size of the external forces for the existence of time periodic solutions in terms of the Coriolis parameter. It follows from our conditions that the unique existence of time periodic solutions is guaranteed for large external forces provided the speed of rotation is sufficiently fast.

- 82 Tsukasa Iwabuchi (Chuo Univ.)^{*} Global solutions for the Navier–Stokes equations in the rotational frame-
 Ryo Takada (Kyoto Univ.) work 10

Summary: The existence of global solutions for the Navier–Stokes equations with the Coriolis force is considered in the homogeneous Sobolev spaces. Without Coriolis force, it is known that the unique global solutions are obtained if the initial data is sufficiently small. In this talk, the unique global solutions are obtained for large initial data if the speed of rotation is sufficiently large.

- 83 Tsuyoshi Yoneda (Hokkaido Univ.) A mathematical clue to the separation phenomena on the two-dimensional Navier–Stokes equation 10

Summary: In general, before separating from a boundary, the flow moves toward reverse direction near the boundary against the laminar flow direction. In this talk, we consider the non-stationary two-dimensional Navier–Stokes equation with an initial datum having a parallel laminar flow (we define it rigorously). We show that the direction of the material differentiation is opposite to the initial flow direction and effect of the material differentiation (inducing the reverse flow) becomes bigger when the curvature of the boundary becomes bigger.

- 84 Kei Matsuura (Waseda Univ.)* Mitsuharu Ôtani (Waseda Univ.) Initial-boundary value problem for micropolar fluid equations with spin-vorticity interaction boundary condition 10

Summary: Micropolar fluid is a model of fluid which contains small particles. The system of equations of micropolar fluid has two unknown vector fields, velocity of fluid and microrotation vector of particles. We consider the initial-boundary value problem of micropolar fluid equations in a bounded domain. On the boundary it is imposed that the angular momentum of particles are proportional to the vorticity of fluid. Under this boundary condition, it is shown that there exists a unique time-local solution. It will be also discussed the existence of time-global solutions for sufficiently small data.

- 85 Noboru Chikami (Tohoku Univ.)* The local existence and blow-up criterion of the compressible Navier–Stokes system with a Yukawa-potential 10

Summary: We consider the Cauchy problem of the compressible Navier–Stokes equation with a Yukawa-potential, which is a simplified hydrodynamical model describing the nuclear matter. We discuss the local existence and uniqueness result in the scaling critical Besov spaces, and also establish a refined blow-up criterion that corresponds to that of the incompressible version.

- 86 Jan Brezina (Kyushu Univ.)[#] Yoshiyuki Kagei (Kyushu Univ.) Asymptotic behavior of solutions to the compressible Navier–Stokes equation around a time-periodic parallel flow 10

Summary: We consider the initial boundary problem for compressible Navier–Stokes equation with time-periodic external force. We showed that if the Reynolds and Mach numbers are sufficiently small, then strong solutions to the compressible Navier–Stokes equation around a time-periodic parallel flow exist globally in time for sufficiently small initial perturbations. In 2-dimensional case the large time behavior of solutions is described by a solution of a 1-dimensional viscous Burgers equation. In n -dimensions, $n \geq 3$, the large time behavior of solutions is described by a solution of $n - 1$ -dimensional linear heat equation.

- 87 Masashi Ohnawa (Waseda Univ./Tokyo Tech) Shinya Nishibata (Tokyo Tech) * On the convergence rates towards traveling waves for a model system of radiating gas 10

Summary: The present study is concerned with the asymptotic behavior of a discontinuous solution to a model system of radiating gas. Assuming the initial data has a discontinuity at one point, the solution remains discontinuous at one point. Here the discontinuous solution is supposed to satisfy an entropy condition in the sense of Kruzkov. Previous researches have shown that the solution converges uniformly to a traveling wave if an initial perturbation is integrable and is small in the suitable Sobolev space. If its anti-derivative is also integrable, the convergence rate was known to be the time to the power of $-1/4$. In the present research, we improve the previous result and show that the convergence rate is exactly the same as the spatial decay rate of the initial perturbation.

- 88 Masashi Ohnawa (Waseda Univ./Tokyo Tech) * Asymptotic stability of a stationary solution to the Euler–Poisson equations including fluid-boundary interaction 10
 Shinya Nishibata (Tokyo Tech)

Summary: This study is concerned with the analysis of the behavior of a boundary layer, called sheath, which appears over a material in contact with plasma. Its behavior is described by the Euler–Poisson equations over a one-dimensional half space and the sheath is understood as a monotone stationary solution. Under the Dirichlet boundary condition for the electric potential, we have previously shown the asymptotic stability of the stationary solution. In this study, we take into account the accumulation of the charged particle at the boundary due to the flux from the inner region. This leads to the temporal change of Neumann boundary condition for the electric potential and hence to a new potential gradient force to the plasma. Under this fluid-structure interaction setting, we prove the asymptotic stability of the stationary solution.

- 89 Masahiro Suzuki (Tokyo Tech) * Asymptotic behavior of solutions to a shallow water equation 10
 Masahiro Takayama (Keio Univ.)
 Bongsuk Kwon (Ulsan Nat. Inst. of Sci. and Tech.)

Summary: The main concern of this talk is to analyze the asymptotic behavior of the time global solution to the initial boundary value problem for a shallow water equation. If we adopt a boundary condition that the flux of water is constant, then it is proved that there exists a one-parameter family of the stationary solutions. This fact causes a delicate issue of determining the stationary solution, which should be a time asymptotic state of the time global solution. We show the unique existence and the time asymptotic stability of the stationary solution, which satisfies the zero mass condition.

- 90 Tetu Makino (Yamaguchi Univ.) * Application of Nash–Moser theory to gasdynamics 10

Summary: We apply Nash–Moser theory to the one-dimensional motion of compressible gas under constant gravity. Smooth solutions for which periodic solutions of the linearized problem described by Bessel function are first order approximation are obtained.

16:45–17:45 Talk invited by Functional Equations Section

- Hideyuki Miura (Osaka Univ.) On fundamental solutions for fractional diffusion equations with divergence free drift

Summary: In this talk, we consider fractional diffusion equations in the presence of a divergence free drift term. We show the existence of fundamental solutions, together with continuity estimates and pointwise estimates under weak regularity assumptions on the velocity of the drift term.

Real Analysis

September 20th (Thu) Conference Room II

10:00–11:45

- 1 Yuichi Kanjin (Kanazawa Univ.)[#] Hardy-type inequalities for the generalized Mehler transform 15
 Kunio Sato (Yamagata Univ.)

Summary: We establish Hardy-type inequalities for the generalized Mehler transform on the real Hardy space.

- 2 Yutaka Terasawa (Univ. of Tokyo)[#] Positive operators and maximal operators in a filtered measure space
 Hitoshi Tanaka (Univ. of Tokyo) 15

Summary: In a filtered measure space, a characterization of weights for which the trace inequality of a positive operator holds is given. A characterization of weights for which a two-weight norm inequality for a generalized Doob's maximal operator holds is also established. For the proofs of these results, we introduce a refinement of Carleson's embedding theorem. Our result can be regarded as generalizations of the corresponding dyadic harmonic analysis results.

- 3 Yoshihiro Mizuta (Hiroshima Inst. of Tech.)[#] Gagliardo–Nirenberg inequality for generalized Riesz potentials of functions in Musielak–Orlicz spaces 15
 Eiichi Nakai (Ibaraki Univ.)
 Yoshihiro Sawano (Tokyo Metro. Univ.)
 Tetsu Shimomura (Hiroshima Univ.)

Summary: The Riesz potential is defined by $R_\alpha f(x) = \int_{\mathbb{R}^n} |x - y|^{\alpha-n} f(y) dy$ for $0 < \alpha < n$ and a locally integrable function f on \mathbb{R}^n . For $0 < \beta < \alpha < n$ and $1 < p_i < \infty$ ($i = 0, 1$), define p by $\frac{1}{p} = \left(1 - \frac{\beta}{\alpha}\right) \frac{1}{p_0} + \frac{\beta}{\alpha} \frac{1}{p_1}$. Then the classical Gagliardo–Nirenberg inequality for Riesz potentials is the following: $\|R_\beta f\|_{L^p(\mathbb{R}^n)} \leq C \|f\|_{L^{p_0}(\mathbb{R}^n)}^{1-\beta/\alpha} \|R_\alpha f\|_{L^{p_1}(\mathbb{R}^n)}^{\beta/\alpha}$, for all positive measurable functions f . Our main aim is to extend this inequality to generalized Riesz potentials of functions in Musielak–Orlicz spaces.

- 4 Yohei Tsutsui (Waseda Univ.) Weighted inequalities for convolution operators with smooth functions on Hardy spaces and an application to decay property of solutions to Navier–Stokes equations 15

Summary: In this talk, we consider the mapping properties of convolution operators with smooth functions on weighted Hardy spaces $H^p(w)$ with w belonging to Muckenhoupt weight class A_∞ . As an application, we obtain the decay estimate of solutions to Navier–Stokes equations.

- 5 Takanori Yamamoto (Hokkai-Gakuen Univ.)^{*} An argument of a function in $H^{1/2}$ 15
 Takahiko Nakazi (Hokusei Gakuen Univ.)

Summary: Let $H^{1/2}$ be the Hardy space on the open unit disc \mathbb{D} . For two non-zero functions f and g in $H^{1/2}$, we study the relation between f and g when $f/g \geq 0$ a.e. on $\partial\mathbb{D}$. Then we generalize a theorem of Neuwirth and Newman and Helson and Sarason with a simple proof.

6 Shinya Moritoh (Nara Women's Univ.)* Mulholland's inequality revisited 10

Summary: We consider again the convexity condition used in Mulholland's inequality.

14:15–15:40

7 Aoi Honda (Kyushu Inst. of Tech.)[#] On the linearity and metrics of a new sequence space $\Lambda_2(f)$ 15
 Yoshiaki Okazaki
 (Kyushu Inst. of Tech.)
 Hiroshi Sato (Kyushu Univ.)

Summary: A new metric sequence space $(\Lambda_2(f), d_2^f)$ derived from a single $L_2(\mathbb{R}, dx)$ -function f was defined. It is included by ℓ_2 and includes various known sequence spaces such as the Zygmund space ℓ_{2-} . But in general, it is not a linear space and the explicit estimation by sequences of the metric is not trivial.

In this talk, we shall discuss those problems by characterizing the maximal linear subspace $\Lambda_2^0(f)$ of $\Lambda_2(f)$ and introducing a quasi-metric γ_f on it. $\Lambda_2(f)$ is a linear space if and only if $\Lambda_2(f) = \Lambda_2^0(f)$, and γ_f define the same topology with d_2^f .

8 Mikio Kato (Shinshu Univ.)* Weak nearly uniform smoothness of direct sums of Banach spaces 15
 Takayuki Tamura (Chiba Univ.)

Summary: We shall discuss the weak nearly uniform smoothness (WNUS) of the ψ -direct sum $(X_1 \oplus \dots \oplus X_N)_\psi$ for finitely many Banach spaces X_1, \dots, X_N . In the course of doing this we shall introduce a class of convex functions which yield ℓ_1 -like norms. Our result will be applied to the fixed point property for nonexpansive mappings.

9 Mikio Kato (Shinshu Univ.)* On relations between $C_{NJ}(X)$ and $J(X)$ and a new geometric constant
 Yasuji Takahashi (Okayama Pref. Univ.) $A(X)$ 15

Summary: We shall discuss a sequence of recent results on $C_{NJ}(X)$ and $J(X)$ as well as a new constant $A(X)$. Especially, their relations will be given.

10 Koji Aoyama (Chiba Univ.)[#] Strong convergence of an iterative sequence for maximal monotone operators in a Hilbert space 15

Summary: In this talk, we consider the problem of finding a zero of maximal monotone operators in a Hilbert space. Then we show a strong convergence theorem for resolvents of maximal monotone operators.

11 Sachiko Atsushiba[#] Nonlinear mean convergence theorems for nonlinear mappings 15
 (Univ. of Yamanashi)

Summary: In this talk, we prove nonlinear mean convergence theorems for nonlinear mappings. We also give weak convergence theorems for nonexpansive mappings.

15:50–16:50 Talk invited by Real Analysis Section

Jürgen Appell (Univ. Würzburg)[#] Condensing operators and applications: old and new

September 21st (Fri) Conference Room II

9:40–12:00

- 12 Toshikazu Watanabe (Niigata Univ.)[#] On non-additive measures which take values in an ordered topological vector space 15

Summary: Lusin’s theorem is established for real-valued monotone measures under an organized condition for Egoroff’s theorem recently. In this talk, we show a similar result remains valid for non-additive measures that take values in an ordered topological vector space.

- 13 Yasunori Kimura (Toho Univ.)[#] Convergence of subsets of a complete geodesic space with curvature bounded above and its applications 15

Summary: We introduce a new notion of set-convergence in a complete geodesic space with curvature bounded above and obtain a equivalent condition for this convergence by using the sequence of metric projections corresponding to the sequence of subsets. We will also show some recent developments related to this result.

- 14 Yoichi Miyazaki (Nihon Univ.)^{*} A Method to evaluate resolvent kernels of elliptic operators 12

Summary: We present a new method to obtain the well-known estimate for the inverse Fourier transform of $(a(\xi) - \lambda)^{-k}$ in \mathbb{R}^n with $\lambda \in \mathbb{C} \setminus [0, \infty)$ and $k \in \mathbb{N}$, where $a(\xi) = \sum_{|\alpha|=m} a_\alpha \xi^\alpha$ satisfies an ellipticity condition. By a standard way of using a complex integral we get the bound $C|\lambda|^{-k+n/m} \exp(-c_1|\lambda|^{1/m}|x|)$ when $km > n$. The estimate for $km \leq n$ can be reduced to that for $km > n$ by a generalization of the identity $(a(\xi) - \lambda)^{-1} = -\int_\lambda^\infty (a(\xi) - \mu)^{-2} d\mu$. Our method also works for an elliptic operator with variable coefficients subject to suitable boundary conditions in a domain. We can evaluate the kernel of $(A - \lambda)^{-1}$ directly from that of $(A - \lambda)^{-k}$ without considering the semigroup e^{-tA} .

- 15 Noriaki Yamazaki (Kanagawa Univ.)[#] Optimal control of positive solutions to second order impulsive differential equations 15
- Lingling Zhang (Taiyuan Univ. of Tech.)
- Chengbo Zhai (Shanxi Univ.)

Summary: In this talk we consider the optimal control problem of second order impulsive differential equations. We show the existence and uniqueness of positive solutions to our problem for each given control functions. Also, we consider the control problem of positive solutions to our equations. Then, we prove the existence of an optimal control that minimizes the nonlinear cost functional.

- 16 Makoto Nakamura (Tohoku Univ.)^{*} Remarks on global solutions for nonlinear wave equations under the standard null conditions 10

Summary: A combination of some weighted energy estimates is applied for the Cauchy problem of nonlinear wave equations with the standard null conditions in three spatial dimensions. Alternative proofs for global solutions are shown including the exterior domain problems.

- 17 Makoto Nakamura (Tohoku Univ.)* The Cauchy problem for dissipative wave equations with weighted non-linear terms 10
 Hidemitsu Wadade (Gifu Univ.)

Summary: The Cauchy problem for dissipative wave equations with weighted nonlinear terms is considered. The nonlinear terms are power type with a singularity at the origin of Coulomb type. The local and global solutions are shown in the energy class by the use of the Caffarelli–Kohn–Nirenberg inequality. The exponential type nonlinear terms are also considered in the critical two-spatial dimensions.

- 18 Yukino Tomizawa (Chuo Univ.)# Unique solutions to nonautonomous differential equations in Banach spaces 20
 Yoshikazu Kobayashi (Chuo Univ.)
 Naoki Tanaka (Shizuoka Univ.)

Summary: We discuss existence and uniqueness of solutions to nonautonomous differential equations in Banach spaces. We introduce a metric-like functional in order to obtain existence of unique solutions of initial-value problems. Assuming general conditions which is sufficient to treat time-dependent differential equations, we construct approximate solutions to initial-value problems and then show that the approximate solutions converge to unique solutions of initial-value problems. We establish sufficient conditions for initial-value problems to have global solutions.

- 19 Motohiro Sobajima # Generalized Hardy–Rellich inequalities in \mathbb{R}^N for operators with singular first order terms 15
 (Tokyo Univ. of Sci.)

Summary: This talk is concerned with Hardy–Rellich type inequalities for the elliptic operators $T_p = -\Delta + bx|x|^{-2} \cdot \nabla + c|x|^{-2}$ in $L^p(\mathbb{R}^N)$ ($N \in \mathbb{N}$, $1 < p < \infty$, $b, c \in \mathbb{R}$) with optimal constants. The closedness and m -accretivity in $L^p(\mathbb{R}^N)$ of T_p are also discussed via these inequalities.

- 20 Risei Kano (Kochi Univ.)# Asymptotic behavior of solutions for the tumor invasion models 15
 Akio Ito (Kinki Univ.)

Summary: We consider the problem, known as the Chaplain–Anderson type of tumor invasions, an extension of the dependence of the diffusion coefficient. We prove the existence theorem of time global solutions of our problem. And we discuss the asymptotic behavior of solutions as $t \rightarrow \infty$ and the steady problem.

14:15–16:00

- 21 Hiroshi Watanabe (Salasian Polytechnic)# Entropy solutions to initial value problems for strongly degenerate parabolic equations with discontinuous coefficients 15

Summary: We consider the initial value problem (CP) for strongly degenerate parabolic equations with discontinuous coefficients. Strongly degenerate parabolic equations are regarded as a linear combination of the time-dependent conservation laws (quasilinear hyperbolic equations) and the porous medium type equations (nonlinear degenerate parabolic equations). Thus, these equations have both properties of hyperbolic equations and those of parabolic equations and describes various nonlinear convective diffusion phenomena such as filtration problems, Stefan problems and so on. In this talk we define entropy solutions to (CP) and prove the unique existence of entropy solutions under some assumptions.

- 22 Naoki Sato (Nagaoka Nat. Coll. of Tech.)[#] On a one dimensional free boundary problem for adsorption phenomena 20
 Toyohiko Aiki (Japan Women's Univ.)
 Yusuke Murase (Meijo Univ.)

Summary: We study one dimensional free-boundary problem for adsorption phenomena in wet-dry process on the surface of porous medium like paper. We consider a pore in the porous medium. Water-drop will be generated in the pore when humidity becomes high. The boundary of the domain of water-drop is a free boundary in time. We propose a mathematical model for this phenomenon as one dimensional free boundary problem. Our main aim is to investigate the relation between a degree of saturation and humidity. In this talk, we introduce some results with respect to the existence and uniqueness of local solution in time for our problem. At first, we show solvability of auxiliary problems. Next, using Banach's fixed point theorem, we get solvability of our problem.

- 23 Yusuke Murase (Meijo Univ.)[#] Existence results for a mathematical modeling for brewing process of
 Akio Ito (Kinki Univ.) Japanese Sake 15

Summary: "Sake" is brewing liquor with using fermenting technique so-called "Multiple parallel fermentation". "Multiple parallel fermentation" is one of the most difficult way of fermentations. We have a few data about brewing process of Sake because "Multiple parallel fermentation" is too complicated. Furthermore, brewing Sake is supported by the Touji's experience only, but the number of Touji decreases more and more. We research on Sake to realize the some mathematical and engineering targets. In this talk, we discuss existence of solutions for mathematical modeling for brewing process of Japanese Sake which is proposed by Y. Murase and A. Ito.

- 24 Shun Uchida (Waseda Univ.)^{*} The solvability of double-diffusive convection system with Soret's coef-
 Mitsuharu Ôtani (Waseda Univ.) ficient depending on the concentration of solute 15

Summary: Brinkman–Forchheimer equation describes the behavior of the velocity of the fluid in some porous medium. The double-diffusive convection is a physical phenomenon of fluids taking into account of the interaction between the temperature of the fluid and the concentration of solute called Soret's effect, i.e., the gradient of temperature gives the influence on the behavior of the concentration. In this talk, let the Soret's coefficient be real valued function $\rho : \mathbb{R} \rightarrow \mathbb{R}$ and depend on the concentration. Under this setting, we consider the solvability of the system which describes the double-diffusive convection of an incompressive viscous fluid in some kind of porous medium, on the basis of Brinkman–Forchheimer equation.

- 25 Goro Akagi (Kobe Univ.)[#] Doubly nonlinear parabolic equations involving variable exponents ... 15

Summary: This talk is concerned with the solvability of doubly nonlinear parabolic equations involving variable exponents.

- 26 Kota Kumazaki (Tomakomai Nat. Coll. of Tech.)[#] On a mathematical model of moisture transport with a time-dependent
 porosity in concrete carbonation process 15

Summary: In this talk we consider a mathematical model of moisture transport in concrete carbonation process in three dimensional case. This model is a diffusion equation with a hysteresis operator indicating the relationship between the relative humidity and the degree of saturation. Also, this equation has a porosity which contains a non-local term in a coefficient of the time derivative of the unknown function and a perturbation. In this talk we prove the existence of a solution of a initial boundary value problem of this model.

16:10–17:10 Talk invited by Real Analysis Section

Okiihiro Sawada (Gifu Univ.)[#] The ill-posedness theory of the Navier–Stokes equations in the critical space

Summary: The ill-posedness theory of the Navier–Stokes equations in the critical Besov space was proved by Bourgain and Pavlovic. It is shown that the equicontinuity is not equipped within the biggest class of mild solutions. In other words, there is a lack of sensitivity of solutions with respect to initial data. The proof is based on the norm inflation argument. The term-wise estimates for the successive approximation of the mild solutions in the critical Besov norm and its convergence or divergence are established. However, the blow-up at finite time does not occur with the same initial data. Uniform bounds for solutions in time and space follow from the maximum principle, since the pressure vanishes by the renormalization structure of solutions.

Functional Analysis

September 19th (Wed) Conference Room IV

9:45–11:50

- 1 Kazunori Ando (Univ. of Tsukuba)[#] Inverse scattering theory for discrete Schrödinger operators on the hexagonal lattice 15

Summary: We regard the hexagonal lattice as graph, which is a sort of two dimensional lattice and covers the plane by equilateral hexagons with honeycomb structure. Firstly, we study the scattering theory for the discrete Schrödinger operator. We derive Mourre estimates, and obtain the spectral representation and the representation for the scattering matrices. Then, we consider the inverse scattering theory for the Schrödinger operator, and show the reconstruction procedure for the finitely-supported potential on the hexagonal lattice, for which we need two key lemmas, that is, analytic continuations and estimates of resolvents.

- 2 Hisashi Morioka (Univ. of Tsukuba)[#] Inverse scattering at a fixed energy for discrete Schrödinger operators
Hiroshi Isozaki (Univ. of Tsukuba) on the square lattice 15

Summary: We consider the inverse scattering problem for discrete Schrödinger operators $\widehat{H} = -\Delta_{disc} + \widehat{V}$ on the square lattice. In particular, we give a reconstruction procedure of the potential \widehat{V} with a compact support from the S-matrix for a fixed energy. For the proof, we derive the equivalence of the S-matrix and the Dirichlet-to-Neumann map for a sufficiently large bounded domain. Therefore, we can reconstruct \widehat{V} from the S-matrix by solving the inverse boundary value problem.

- 3 Yuji Nomura (Ehime Univ.)[#] Landau levels of Schrödinger operators with periodic Aharonov–Bohm
Takuya Mine (Kyoto Inst. Tech.) magnetic fields on the hyperbolic plane 15

Summary: We consider the magnetic Schrödinger operators on the Poincaré upper half plane with constant Gaussian curvature -1 . We assume the magnetic field is given by the sum of a constant field and Aharonov–Bohm fields placed on some lattice invariant under the action of a discrete group. We give a condition for each Landau level to be an infinitely degenerate eigenvalue in terms of the magnetic flux through the fundamental domain.

- 4 Toshihisa Kubo (Univ. of Tokyo)[#] Conformally invariant systems of second-order differential operators .. 20

Summary: The wave operator \square on the Minkowski space $\mathbb{R}^{3,1}$ is a classical example of a conformally invariant differential operator for $\mathfrak{so}(4, 2)$. Namely, elements of $\mathfrak{so}(4, 2)$ are symmetries of the wave operator \square on an appropriate line bundle over the Minkowski space $\mathbb{R}^{3,1}$. Recently, the notion of conformality of one operator has been generalized by Barchini–Kable–Zierau to systems of differential operators. Such systems are called conformally invariant systems. In this talk we construct such systems of second-order differential operators in the maximal non-Heisenberg parabolic setting. To build such systems of operators we use techniques from the invariant theory of prehomogeneous vector spaces.

- 5 Yoshinori Kametaka (Osaka Univ.)[#] The best constant of discrete Sobolev inequality on a small Fullerene and Carbon nano tube 15

Summary: The best constant of discrete Sobolev inequality on a small Fullerene and Carbon nano tube is obtained. We consider a classical mechanical model, each Carbon atom are connected by a linear spring with uniform spring constant. The best constant of discrete Sobolev inequality is the rigidity or hardness of our mechanical model.

- 6 Jun Hong Ha (Korea Tech.)[#] Unique identification for linearized sine-Gordon equation 15
 Semion Gutman (Univ. of Oklahoma)

Summary: The paper presents theoretical and numerical results on the identifiability, i.e. the unique identification for the one-dimensional sine-Gordon equation. In this paper we establish the identifiability for a linearized sine-Gordon problem. Our method consists of a careful analysis of the Laplace and Fourier transforms of the observation of the system, conducted at a single point. Numerical results based on the best fit to data method confirm that the identification is unique for a wide choice of initial approximations for the sought test parameters. Numerical results compare the identification for the nonlinear and the linearized problems.

- 7 Shin-ichi Nakagiri (Kobe Univ.)[#] Identifiability of advection-diffusion equations 15

Summary: In this paper, we study identifiability problems for advection-diffusion equations by means of deformation formulas and Gel'fand Levitan theory. As an application of results, we solve the inverse flux problem for a coupled transport-diffusion system appearing in chemical reactor process.

13:00–14:00 Talk invited by Functional Analysis Section

- Kiyoomi Kataoka (Univ. of Tokyo)[#] A system of fifth-order partial differential equations describing a surface which contains several continuous families of circular arcs

Summary: Let $z = f(x, y)$ be a germ of a C^5 -surface at the origin in \mathbb{R}^3 containing several continuous families of circular arcs. For examples, we have a usual torus with 4 such families and R. Blum's cyclide with 6 such families. We introduce a system of fifth-order nonlinear partial differential equations for f , and prove that this system of equations describes such a surface germ completely. As applications, we obtain the analyticity of f , and the finite dimensionality of the solution space of such a system of differential equations. Further we succeeded in analyzing the systems corresponding the surfaces including six continuous families of circular arcs under some conditions on the third order derivatives of f at the origin.

September 20th (Thu) Conference Room IV

9:30–11:50

- 8 Kengo Matsumoto * Full groups of one-sided topological Markov shifts and classification of (Joetsu Univ. of Edu.) Cuntz–Krieger algebras 15

Summary: Let (X_A, σ_A) be the right one-sided topological Markov shift for an irreducible matrix with entries in $\{0, 1\}$, and Γ_A its continuous full group. For two irreducible matrices A and B , it will be shown that the continuous full groups Γ_A and Γ_B are isomorphic as abstract groups if and only if their one-sided topological Markov shifts (X_A, σ_A) and (X_B, σ_B) are continuously orbit equivalent. As a result, under the condition $\det(A - 1)\det(B - 1) \geq 0$, we see that the groups Γ_A and Γ_B are isomorphic if and only if the Cuntz–Krieger algebras \mathcal{O}_A and \mathcal{O}_B are isomorphic.

- 9 Takahiro Sudo (Univ. of Ryukyus)[‡] Corona rank for Banach or C^* -algebras 15

Summary: We introduce a notion of rank for Banach or C^* -algebras. We study its basic properties and close relation with the topological stable rank of Rieffel.

- 10 Rui Okayasu (Osaka Kyoiku Univ.)[‡] Free group C^* -algebras associated with ℓ_p 15

Summary: We consider the group C^* -algebras associated with ℓ_p , which is defined by Brown and Guentner. We give a characterization of positive definite functions on a free group, which can be extended to the positive linear functionals on the free group C^* -algebra associated with ℓ_p . This is a generalization of Haagerup's characterization for the case of the reduced free group C^* -algebra. As a consequence, the associated C^* -algebras are mutually non-isomorphic, and they have a unique tracial state.

- 11 Yusuke Isono (Univ. of Tokyo)[‡] Weak exactness for C^* -algebras and application to condition (AO) ... 15

Summary: We generalize Kirchberg's weak exactness to inclusions of C^* -algebras in von Neumann algebras and study some characterizations and permanence properties which are similar to those of exact groups. We then consider a similar condition to Ozawa's condition (AO) with our weak exactness and generalize Ozawa's theorem for bi-exact groups. As a corollary, we give new examples of prime factors.

- 12 Norio Nawata (Chiba Univ.)[‡] Fundamental group of uniquely ergodic Cantor minimal systems 15

Summary: We introduce the fundamental group $\mathcal{F}(\mathcal{R}_{G,\varphi})$ of a uniquely ergodic Cantor minimal G -system $\mathcal{R}_{G,\varphi}$ where G is a countable discrete group. We compute fundamental groups of several uniquely ergodic Cantor minimal G -systems and show that if $\mathcal{R}_{G,\varphi}$ arises from a free action φ of a finitely generated abelian group, then there exists a unital countable subring R of \mathbb{R} such that $\mathcal{F}(\mathcal{R}_{G,\varphi}) = R_+^\times$. Therefore $\{4^n : n \in \mathbb{Z}\}$ cannot be realized as the fundamental group of a Cantor minimal system in this class. Furthermore we consider the relation between fundamental groups of uniquely ergodic Cantor minimal \mathbb{Z}^n -systems and fundamental groups of crossed product C^* -algebras $C(X) \rtimes_\varphi \mathbb{Z}^n$.

- 13 Tsuyoshi Kajiwara (Okayama Univ.)[‡] Ideals of the core of C^* -algebras associated with self-similar maps 15
Yasuo Watatani (Kyushu Univ.)

Summary: When a self-similar map has branched points, the core of the C^* -algebra associated with the self similar map have many ideals. In this talk, we classify all ideals of the core of the C^* -algebras associated with self similar maps, using the matrix representation of the core and the construction of traces. We show that there exists one to one correspondence between primitive ideals and minimal traces. Moreover, we determine the type of von Neumann algebras generated by the GNS representation associated with minimal traces.

- 14 Hiroki Sako (Kyoto Univ.)^{*} Property A and the operator norm localization property for discrete metric spaces 15

Summary: I will introduce property A defined by G. Yu and the operator norm localization property defined by Chen, Tessera, Wang, and Yu. These are coarse geometric properties for metric spaces which have applications to operator K-theory. It is proved that the two properties are equivalent for discrete metric spaces with bounded geometry. I will also make comments on a coarse geometric property defined by Brodzki, Niblo, Spakula, Willett, and Wright

15 Takahiro Hasebe (Kyoto Univ.)[#] Cumulants for spreadability system 15
 Franz Lehner (Graz Univ. of Tech.)

Summary: Lehner, an author of this research, proposed the concept of exchangeability systems to unify non-commutative independences and cumulants, in particular classical and free independences. This approach was so general, but one exception was monotone independence. On the other hand, Hasebe, the other author, and Saigo defined monotone cumulants as appropriate objects for monotone independence. In this talk we present a unifying method to define cumulants for various kinds of independence including exchangeability systems and monotone independence.

14:15–16:30

16 Masaru Nagisa (Chiba Univ.)^{*} Characterization of the diagonality for operators 10
 Takashi Itoh (Gunma Univ.)

Summary: We define a Schur product for bounded linear operators on a Hilbert space by the similar way for matrices. Using the relation of the usual product of an operator A and the Schur product of A , we can get the diagonality of A if A is invertible.

17 Masaru Nagisa (Chiba Univ.)[#] Some operator monotone functions 10
 Masato Kawasaki (Chiba Univ.)

Summary: We consider an operator monotone function. Let f and g be operator monotone, non-negative and $\frac{f(t)g(t)}{t}$ operator monotone. Then we have $h(t) = (t-a)(t-b)/(f(t)-f(a))(g(t)-g(b))$ is also operator monotone. We also construct another operator monotone functions. As a corollary, we can show the Petz–Hasagawa functions are also operator monotone.

18 Takeaki Yamazaki (Toyo Univ.)[#] On some matrix inequalities for the matrix power and Karcher means
 Yongdo Lim (Kyungpook Nat. Univ.) 10

Summary: We shall introduce some matrix inequalities which are related to matrix power means. Matrix power means have been defined by Lim–Palfia, and the Karcher mean (Riemannian geometric mean) can be considered as a limit of matrix power mean. We shall introduce some matrix inequalities which is related to the matrix power means.

19 Yuki Seo (Osaka Kyoiku Univ.)[#] The Jensen inequality in an external formula 10

Summary: In this talk, considering that the Jensen inequality is also expressed by externally dividing points, we shall discuss non-commutative Jensen inequalities and their reverse. We show an external version of the Jensen inequality which corresponds to a two variable vector state version.

20 Mitsuru Uchiyama (Shimane Univ.)[#] The principal inverse of the gamma function 15

Summary: Let $\Gamma(x)$ be the gamma function in the real axis and α the maximal zero of $\Gamma'(x)$. We call the inverse function of $\Gamma(x)|_{(\alpha, \infty)}$ the principal inverse and denote it by $\Gamma^{-1}(x)$. We show that $\Gamma^{-1}(x)$ has the holomorphic extension $\Gamma^{-1}(z)$ to $\mathbf{C} \setminus (-\infty, \Gamma(\alpha)]$, which maps the upper half plane into itself, namely a Pick function, and that $\Gamma(\Gamma^{-1}(z)) = z$ on $\mathbf{C} \setminus (-\infty, \Gamma(\alpha)]$.

21 Keiichi Watanabe (Niigata Univ.)^{*} An inequality between products of $x^p - 1$ 15

Summary: We show an inequality related to $\prod_j (x^{p_j} - 1)$.

22 Kei Ji Izuchi (Niigata Univ.)* Sums of weighted composition operators on H^∞ 10
 Shūichi Ohno (Nippon Inst. of Tech.)

Summary: We characterize compactness of sums of weighted composition operators on the Banach algebra of bounded analytic functions on the open unit disk.

23 Takuya Hosokawa (Ibaraki Univ.)* Differences of weighted composition operators from the Bloch space to
 Shūichi Ohno (Nippon Inst. of Tech.) H^∞ 15

Summary: We study the boundedness and compactness of the differences of two weighted composition operators acting from the Bloch space to H^∞ of bounded analytic functions on the open unit disk.

16:30–17:30 Talk invited by Functional Analysis Section

Shūichi Ohno (Nippon Inst. of Tech.)* Topological structure of the space of weighted composition operators
 on H^∞

Summary: The study of composition operators lies at the interface of analytic function theory and operator theory and so has been extensively done during the past few decades. Presently some of the open questions in this field are related to the topological structure of the space of (weighted) composition operators on various analytic function spaces. We consider such a problem on the space of bounded analytic functions on the open unit disk.

September 21st (Fri) Conference Room IV

9:30–11:50

24 Masatoshi Enoto (Koshien Univ.)* Brick Hilbert representaions of the Kronecker quiver by perturbation of
 Yasuo Watatani (Kyushu Univ.) a finite rank operator 15

Summary: We study indecomposable representations of quivers on Hilbert spaces by bounded linear operators. The indecomposable representations of the Kronecker quiver on finite dimensional Hilbert spaces are completely classified by Kronecker. We construct indecomposable representations of the Kronecker quiver on infinite dimensional Hilbert spaces with trivial endomorphisms by perturbation of a finite rank operator.

25 Reiji Tomatsu (Hokkaido Univ.)[#] On a classification of Rohlin flows on von Neumann algebras 15

Summary: I will talk about a classification of Rohlin flows on von Neumann algebras. This is a joint work with Toshihiko Masuda.

26 Satoshi Goto (Sophia Univ.)[#] On a mixed quantum double construction of subfactors 10

Summary: For a given flat connection on four graphs, we consider a commuting square analogous to that of the asymptotic inclusion. This commuting square produces a subfactor which is isomorphic to the asymptotic inclusion of both subfactors constructed horizontally and vertically from the original flat connection, when the initial graphs are connected. We call this construction “a mixed quantum double construction”. We describe the bimodules arising from these mixed quantum double subfactors and give some examples including the case when the initial graphs are not connected.

14:15–15:15 Talk invited by Functional Analysis SectionMutsumi Saito (Hokkaido Univ.)[#] Irreducible quotients of A -hypergeometric systems

Summary: In this talk, we determine the irreducible quotients of an A -hypergeometric system (also known as a GKZ system after Gel'fand, Kapranov, and Zelevinskii). As a corollary, we see that an A -hypergeometric system is irreducible if and only if its parameter vector is non-resonant. Furthermore, we show that any irreducible module appears as an irreducible quotient of an A -hypergeometric system at most once.

6 Naoki Kubota (Nihon Univ.)[#] Large deviations for simple random walk on supercritical percolation clusters 15

Summary: We prove quenched large deviation principles governing the position of the random walk on a supercritical site percolation on the integer lattice. A feature of this model is non-ellipticity of transition probabilities. Our analysis is based on the consideration of so-called Lyapunov exponents for the Laplace transform of the first passage time. The rate function is given by the Legendre transform of the Lyapunov exponents.

7 Daisuke Shiraiishi (Kyoto Univ.)[#] Cut points for simple random walks 15

Summary: We consider two random walks conditioned never to intersect in the plane. We show that each of them has infinitely many global cut times with probability one. Next we consider the union of their trajectories to be a random subgraph in the plane and show the subdiffusivity of the simple random walk on this graph.

8 Sergio Albeverio (Univ. Bonn)[#] Probabilistic conclusion of constructive Euclidean $(\Phi_4)^4$ quantum field theory I 15
 Minoru W Yoshida (Tokyo City Univ.)

Summary: The constructive Euclidean quantum field theory of $(\Phi_4)^4$ has been considered for about 50 years. From the probabilistic point of view, several known results on this subjects are not satisfactory. Here, we try to give some of concluding results for the probabilistic problems corresponding to this. We give, for e.g., a clear result on the problem of existence of probability measure on $\mathcal{S}'(\mathbb{R}^4)$ which corresponds to the $(\Phi_4)^4$ Euclidean quantum field.

9 Itaru Mitoma (Saga Univ.)[#] Asymptotic expansion for oscillatory integrals of Wiener functionals 25

Summary: In an abstract Wiener space, we derive an asymptotic expansion formula of an oscillatory integral by the Fujiwara–Kumano-go method and apply it to the perturbative expansion of the Chern–Simons integral.

14:15–14:45

10 Naoyuki Ichihara (Hiroshima Univ.)^{*} Criticality of Hamilton–Jacobi–Bellman equations and stochastic ergodic control 15

Summary: We discuss some nonlinear eigenvalue problems for viscous Hamilton–Jacobi equations arising in stochastic ergodic control. Qualitative properties of principal eigenvalues and associated eigenfunctions are discussed. We also study the recurrence of feedback diffusions, which is a key in the construction of optimal control. As a special case of our results, we rediscover the problem of criticality for linear Schrödinger equations with decaying potentials.

11 Masaaki Tsuchiya (Kanazawa Univ.)^{*} Probabilistic representation of weak solutions to a parabolic equation with a mixed boundary condition 15

Summary: The probabilistic representation of solutions to parabolic equations is a useful tool to analyze these solutions (e.g., sensitivity analysis of solutions, numerical analysis of solutions). We have studied an estimation problem for the shape of a domain with time varying unknown parts, using thermal data from measurements on an accessible part of the boundary. Motivated by constructing an algorithm to estimate the shape, we here establish the probabilistic representation of weak solutions to a parabolic equation with a mixed boundary condition on a Lipschitz domain with time varying parts of the boundary.

15:00–16:00 Talk invited by Statistics and Probability Section

Toshihiro Uemura (Kansai Univ.)[#] On jump-type Markov processes and the associated Dirichlet forms

16:15–17:15 Talk invited by Statistics and Probability Section

Kazumasa Kuwada (Ochanomizu Univ.)[#] Coupling methods for heat distributions and curvature-dimension conditions

Summary: We consider behavior of some transportation costs between two heat distributions (mainly) on Riemannian manifolds with a lower Ricci curvature bound and an upper dimension bound (or the curvature-dimension condition). For them, a coupling of two differently scaled Brownian motions by parallel transport will be studied. When there is no dimensional upper bound, a lower Ricci curvature bound is equivalent to several probabilistic or analytic properties, such as monotonicity of (exponentially scaled) Wasserstein distances between heat distributions, Bakry–Émery’s gradient estimate for the heat semigroup, or convexity in Wasserstein distance of relative entropy functional. Each of those properties has rich applications in geometry, analysis and probability theory and some of those results have been extended on (singular) metric measure spaces. In the talk, we will review those developments, introduce the above-mentioned result and discuss a relationship with geometric or analytic properties as an analog of studies under only the curvature bound.

September 19th (Wed) Conference Room V

9:15–12:00

- 12 Takahiro Hasebe (Kyoto Univ.)[#] Examples of infinitely divisible distributions in free probability 15
 Noriyoshi Sakuma
 (Aichi Univ. of Edu.)
 Octavio Arizmendi
 (Univ. des Saarlandes)

Summary: In free probability, the concept of free infinite divisibility is defined for a probability measure on the real line. This class appears as the eigenvalue distributions of large matrix-valued Lévy processes whose probability distributions are invariant with respect to the action of unitary matrices.

There were not many examples of freely infinitely divisible measures, so we have been trying to find some. In this talk we will present several examples such as χ^2 with degree one and t-distributions.

- 13 Sho Matsumoto (Nagoya Univ.)[#] Correlation functions for real zeros of a Gaussian power series and Tomoyuki Shirai (Kyushu Univ.) Pfaffians 15

Summary: We show that the real zeros of the random power series whose coefficients are i.i.d. real standard Gaussian variables form a Pfaffian point process.

- 14 Akihiko Inoue (Hiroshima Univ.)[#] Multivariate completely nondeterministic stationary processes 15
 Yukio Kasahara (Hokkaido Univ.)
 Mohsen Pourahmadi
 (Texas A&M Univ.)

Summary: We study multivariate completely nondeterministic stationary processes and give some necessary and sufficient conditions for them.

- 15 Hiroki Hashiguchi (Saitama Univ.)[#] Holonomic gradient method for the distribution function of the largest root of a Wishart matrix 15
 Yasuhide Numata
 (Univ. of Tokyo/JST CREST)
 Nobuki Takayama (Kobe Univ.)
 Akimichi Takemura (Univ. of Tokyo)

Summary: We apply the holonomic gradient method to the evaluation of the exact distribution function of the largest root of a Wishart matrix, which involves the hypergeometric function ${}_1F_1$ of a matrix argument. Compared to methods based on infinite series expansion in terms of zonal polynomials, whose convergence is slow, the proposed method is more practical for computing upper tail probabilities. We show that our proposed method works well up to dimension 10.

- 16 Tamio Koyama (Kobe Univ.)[#] Calculation of the orthant probability by the holonomic gradient method
 Akimichi Takemura (Univ. of Tokyo) 15

Summary: We apply the holonomic gradient method for the accurate evaluation of the orthant probability. Compared to other known methods based on recursive integration algorithms or Monte-Carlo method, the proposed method can evaluate the related orthant probabilities simultaneously. We show that our proposed method works well up to dimension 10. And the accuracy of the proposed method is greater than or equal to that of other known methods.

- 17 Hajime Yamato (Kagoshima Univ.)[#] Asymptotic distribution of number of distinct observations among a sample from mixture of Dirichlet processes 10

Summary: A sample of size n is taken from a random distribution having mixture of Dirichlet processes. We consider a random partition of the positive integer n based on equivalence among the sample. For the number K_n of different classes of the partition, the order of convergence in distribution is derived.

- 18 Yoichi Nishiyama (Inst. of Stat. Math.)[#] Moment convergence of Z -estimators 15

Summary: When we have derived an asymptotic distribution of the rescaled residual of some parametric estimators, it is an important issue to extend the result up to the convergence of high order moment of the rescaled residual to the corresponding moment of the limit. Such a problem has been considered for MLEs and Bayes estimators by the authorized theory of Ibragimov and Has'minskii (1981, Springer book) and for general M -estimators by Yoshida (2011, Ann. Inst. Statist. Math.). In this talk, this problem will be discussed for Z -estimators. A set of sufficient conditions for the convergence will be presented. While a large deviation type inequality was the crucial point for the case of M -estimators, it is possible to give a simple proof based only on usual Hölder's and Minkowski's inequalities in the case of Z -estimators.

- 19 Yoichi Nishiyama (Inst. of Stat. Math.)[#] Z -process method for change point problems 15

Summary: A general method to test the existence of a change point in statistical parametric models not only for i.i.d. data but also for stochastic processes will be presented. The method is based on the partial sum process of the score. Our aim is to make it possible to treat also some statistical models where the information is charged inhomogeneously in time (i.e., non-ergodic models). Our examples include the parametric model for volatility of diffusion processes and Cox's regression models with censoring and time-dependent covariates. In such cases, the limit distribution of our test is not the functional of standard Brownian bridges as in the usual case but that of a "mixture" of standard Brownian motions, and the "mixture process" is given in terms of "partial Fisher information matrix" which is random. It is possible to construct a critical region by a computer intensive method.

- 20 Akio Tanikawa (Osaka Inst. of Tech.)[#] On the rate of convergence of the sequential quadratic method for differential games 10
- Hiro Mukai (Washington Univ.)
- Min Xu (Washington Univ.)

Summary: For computing a Nash (saddle point) solution to a zero-sum differential game for a general nonlinear system, Mukai et al. presented an iterative Sequential Quadratic-Quadratic Method (SQQM) as follows. Given a solution estimate, they defined a non-standard subproblem which approximates the original problem up to the second order around the solution estimate, proposed to solve the subproblem conveniently by a Riccati equation method, and then update the solution estimate by adding its Nash solution to the current solution estimate for the original game. We will state the rate of convergence of the SQQM.

- 21 Satoshi Suzuki (Shimane Univ.)[#] On surrogate duality for quasiconvex programming 20
- Daishi Kuroiwa (Shimane Univ.)

Summary: In the study of mathematical programming, various duality theorems have been introduced, for example, Lagrange duality, Fenchel duality, surrogate duality, and so on. In convex programming, Lagrange duality have been investigate by many researchers. In quasiconvex programming, surrogate duality plays important roles. Recently, necessary and sufficient constraint qualifications for Lagrange duality have been investigated. Motivated by this result, we proposed necessary and sufficient constraint qualifications for surrogate duality. In this talk, we introduce this necessary and sufficient constraint qualification for surrogate duality, and we explain the relation between these constraint qualifications.

September 20th (Thu) Conference Room V

9:15–12:00

- 22 Yoshifumi Hyodo[#] Existence conditions for balanced fractional 2^m factorial designs of resolution $2\ell + 1$ derived from simple arrays 15
- (Okayama Univ. of Sci./Int. Inst. for Nat. Sci.)
- Hiromu Yumiba (Int. Inst. for Nat. Sci.)
- Masahide Kuwada (Int. Inst. for Nat. Sci.)

Summary: We consider a fractional 2^m factorial design derived from a simple array (SA) such that the $(\ell + 1)$ -factor and higher-order interactions are negligible, where $2\ell \leq m$. In this situation, we give a necessary and sufficient condition for an SA to be a balanced fractional 2^m factorial design of resolution $2\ell + 1$. Such a design is concretely characterized by the suffixes of the indices of an SA.

- 23 Sanpei Kageyama[#] The existence of 2 pairwise additive BIB designs 15
- (Hiroshima Inst. of Tech.)
- Kazuki Matsubara (Hiroshima Univ.)

Summary: The existence of additive balanced incomplete block (BIB) designs has been discussed with direct and recursive constructions in Sawa et al. (2007). In this talk, pairwise additive BIB designs are proposed and new recursive methods of constructing such designs are provided. It is finally shown that for any integer v , 2 pairwise additive BIB designs with v treatments, $k = 2$ and $\lambda = 1$ can be constructed. As a by-product, we present a recursive construction of multiply nested BIB designs of block sizes being powers of 2.

- 24 Ryota Shinjo (Tokyo Univ. of Sci.)[#] Improved measure on extended marginal homogeneity for square contingency tables with ordered categories 10
 Kouji Yamamoto (Osaka Univ.)
 Sadao Tomizawa (Tokyo Univ. of Sci.)

Summary: For square contingency tables with ordered categories, Yamamoto, Furuya, and Tomizawa (2007) considered measure to represent the degree of departure from extended marginal homogeneity. This measure ranges between 0 and 1, and attains the maximum value when one of two symmetric cumulative probabilities for any category is zero. This talk proposes an improved measure so that the degree of departure from extended marginal homogeneity can attain the maximum value even when the cumulative probabilities are not zeros. The measure proposed is of more practical use and an example is also given.

- 25 Kouji Yamamoto (Osaka Univ.)[#] Generalized asymmetry model for cumulative probabilities and its decomposition for square tables 10
 Kouji Tahata (Tokyo Univ. of Sci.)
 Sadao Tomizawa (Tokyo Univ. of Sci.)

Summary: For the analysis of square contingency tables with ordered categories, we propose a generalized asymmetry model, which has the structure of asymmetry for cumulative probabilities that an observation will fall in row (column) category i or below and column (row) category j ($> i$) or above, in this talk. We also give the theorem of decomposing the new model into the cumulative extended quasi-symmetry model and the generalized marginal homogeneity model.

- 26 Kouji Tahata (Tokyo Univ. of Sci.)[#] Decomposition of symmetry using palindromic symmetry model for square contingency tables 10
 Kouji Yamamoto (Osaka Univ.)
 Sadao Tomizawa (Tokyo Univ. of Sci.)

Summary: For the analysis of square contingency tables with nominal categories, Caussinus (1965) showed that the symmetry model holds if and only if both quasi-symmetry and marginal homogeneity models hold. In this talk, for square contingency tables with ordered categories we show that the symmetry model holds if and only if all the palindromic symmetry, the marginal means equality and the cumulative subsymmetry models hold. The palindromic symmetry model is also decomposed into the generalized palindromic symmetry and the extended marginal homogeneity models.

- 27 Nobuhiro Taneichi (Kagoshima Univ.)[#] On asymptotic expansions of the null distributions of ϕ -divergence statistics for testing a logistic regression model 15
 Yuri Sekiya (Hokkaido Univ. of Edu.)

Summary: In a logistic regression model, we derived an expression of asymptotic expansion for the distribution of deviance D under a null hypothesis that a logistic regression model is correct (Taneichi et al., *J. Multivariate Anal.*, 102 (2011), 1263–1279). Using the continuous term of the expression, we proposed a Bartlett-type transformed statistic \tilde{D} . By numerical comparison, we showed that the power of \tilde{D} is not so different from the power of D and that \tilde{D} is effective for improving the speed of convergence to the chi-square limiting distribution. In this announcement, we extend the study of Taneichi et al. (2011), and we derive expressions of asymptotic expansions for the null distributions of ϕ -divergence goodness-of-fit test statistics.

28 Kazuyoshi Yata (Univ. of Tsukuba)[#] PCA consistency for high-dimensional data under generalized models
 Makoto Aoshima (Univ. of Tsukuba) 15

Summary: In recent years, substantial work has been done on high-dimensional, low-sample-size (HDLSS) asymptotic theory. Yata and Aoshima (2009, Commun. Statist.) developed the HDLSS asymptotic theory without assuming the normality of an underlying distribution under a spiked covariance model introduced by Johnstone (2001). They gave consistency properties of the conventional eigenvalue estimator in the HDLSS context. In this talk, we develop the HDLSS asymptotic theory for generalized models including the spiked covariance model. Furthermore, we investigate consistency properties of the two modern PCA called the noise-reduction methodology and the cross-data-matrix methodology, which were created by Yata and Aoshima (2010, JMA; 2012, JMA).

29 Kenta Hamada (Waseda Univ.)[#] Shrinkage estimation and prediction for time series 15
 Masanobu Taniguchi (Waseda Univ.)

Summary: For independent samples, shrinkage estimation theory has been developed systematically. Although shrinkage estimators are biased, they improve the MSE of unbiased ones. In view of this, we will develop shrinkage estimation theory and prediction for dependent samples. First, we propose a shrinkage estimator for the coefficients of AR model, which improves the MSE of the least squares estimator. Second, we discuss the problem of shrinkage prediction, and propose a shrinkage predictor which improves the prediction error of the best linear predictor with finite lag length. The results are applied to portfolio estimation etc. We provide numerical studies, which show some interesting features of shrinkage problems in time series analysis.

30 Yoshihide Kakizawa (Hokkaido Univ.)[#] Generalized Cordeiro–Ferrari Bartlett-type adjustment 10

Summary: The Bartlett-type adjustment is a higher-order asymptotic method for reducing the errors of the chi-squared approximations to the null distributions of various test statistics. Three influential papers were published in 1991; Chandra and Mukerjee (CM), Cordeiro and Ferrari (CF) and Taniguchi (T) in alphabetical order. Kakizawa (2012) recently revisited the CM/T-adjustments in a unified way, since CM and T originally considered the test of the simple null hypothesis, except for Mukerjee (1992). In this talk, we consider a generalization of the CF-adjustment.

31 Yoshihide Kakizawa (Hokkaido Univ.)[#] Third-order local powers of several Bartlett-type adjusted tests 15

Summary: The Bartlett-type adjustment is a higher-order asymptotic method for reducing the errors of the chi-squared approximations to the null distributions of various test statistics. It is important to compare several Bartlett-type adjustments under a sequence of local alternatives. This problem was first discussed by Rao and Mukerjee (1995, 1997) and Kakizawa (2010) in the absence of the nuisance parameters. In this talk, we derive the third-order average local powers of several Bartlett-type adjusted test statistics in the presence of the nuisance parameters.

32 Hiroki Masuda (Kyushu Univ.)[#] On self-normalized residuals of SDE 10

Summary: We consider a class of nonlinear stochastic differential equations (SDE) observed at high frequency. We specify asymptotic behaviors of some statistics consisting of partial sums of powered approximate self-normalized residuals. The result can be used to construct a very simple test statistics for the driving-noise normality, which is consistent against the presence of arbitrary jump component.

14:30–15:30 Talk invited by Statistics and Probability Section

Shogo Kato (Inst. of Stat. Math.)[#] The Cauchy distribution on the circle and related statistical models

Summary: The Cauchy distribution on the circle or, simply, the circular Cauchy distribution is a continuous probability distribution on the unit circle. In this talk we discuss two topics related to this probability distribution. First we investigate some properties of the circular Cauchy distribution. The distribution is shown to have some relationship with the Möbius transformation, i.e., a conformal mapping which projects the unit disc onto itself. Second some statistical models related to the distribution are presented. In particular we focus on a discrete-time Markov process which takes on the unit circle for which the circular Cauchy distribution is adopted as an angular error distribution. It is shown that some properties of the process, including the limiting behaviour and ergodicity, are obtained by applying the features of the circular Cauchy. Finally statistical inference of the Markov process is briefly considered.

15:45–16:45 Talk invited by Statistics and Probability Section

Hidetoshi Murakami [#] Some saddlepoint approximations to the nonparametric tests and biased
(Nat. Defense Acad. of Japan) for two-sided alternatives

Summary: Calculating the exact critical value of the test statistic is important in nonparametric statistics. However, to evaluate the exact critical value is difficult when the sample sizes are moderate to large. Under these circumstances, to consider more accurate approximation for the distribution function of a test statistic is extremely important. We performed a saddlepoint approximation in the upper tails for the nonparametric statistics under finite sample sizes. We then compared the saddlepoint approximations with the normal approximation and investigate the accuracy of the approximations. Additionally, the orders of errors of the saddlepoint approximations were derived. In addition, the nonparametric rank tests are investigated to be unbiased against the two-sided alternatives or not.

Applied Mathematics

September 18th (Tue) Conference Room VI

9:30–12:00

- 1 Takamichi Sushida (Ryukoku Univ.)[#] Triangular spiral tilings 20
 Akio Hizume (Ryukoku Univ.)
 Yoshikazu Yamagishi (Ryukoku Univ.)

Summary: The topology of spiral tilings is intimately related to the phyllotaxis theory, which studies arrangements of leaves and other organs of plants such as seeds of a sunflower. A quadrilateral spiral multiple tiling is produced by a suitable chosen triplet (ζ, m, n) , where $\zeta \in \mathbb{D} \setminus \mathbb{R}$ and $m, n > 0$ are relatively prime integers. If three vertices of a quadrilateral are collinear, then it becomes a triangle. The set of generators ζ for triangular spiral multiple tilings is a union of real algebraic curves. The tilings with opposed parastichy pairs are related to continued fractions. The tilings with non-opposed parastichy pairs have a dense set of generators. Moreover, we present their origami (paper-folding) developments.

- 2 Midori Kobayashi (Univ. of Shizuoka)[#] Dudeney’s round table problem and neighbour-balanced Hamilton de-
 Nobuaki Mutoh (Univ. of Shizuoka) compositions 10
 Gisaku Nakamura (Univ. of Shizuoka)

Summary: Dudeney’s round table problem asks for a set of Hamilton cycles in K_n having the property that each 2-path in K_n lies in exactly one of the cycles. In this talk, we show how to construct a solution of Dudeney’s round table problem for even n from a semi-antipodal Hamilton decomposition of K_{n-1} .

- 3 Tomoki Nakamigawa [#] A Ramsey type problem for multiple disjoint copies of induced sub-
 (Shonan Inst. of Technology) graphs 10

Summary: Let k and ℓ be positive integers with $\ell \leq k - 2$. It is proved that there exists a positive integer c depending on k and ℓ such that every graph of order $(2k - 1 - \ell/k)n + c$ contains n vertex disjoint induced subgraphs, where these subgraphs are isomorphic to each other and they are isomorphic to one of four graphs: (1) a clique of order k , (2) an independent set of order k , (3) the join of a clique of order ℓ and an independent set of order $k - \ell$, or (4) the union of an independent set of order ℓ and a clique of order $k - \ell$.

- 4 Shuya Chiba (Tokyo Univ. of Sci.)[#] Tutte cycles and Hamiltonicity of 4-connected claw-free graphs 20
 Roman Čada (Univ. of West Bohemian)
 Kenta Ozeki (Nat. Inst. of Information)
 Petr Vrána (Univ. of West Bohemian)
 Kiyoshi Yoshimoto (Nihon Univ.)

Summary: A graph G is said to be claw-free if G has no induced subgraph isomorphic to $K_{1,3}$. For a cycle C of order at least 4 in a graph G , C is called a Tutte cycle of G if every component of $G - V(C)$ has at most three neighbors on C . It is known that the conjectures by Matthews and Sumner (every 4-connected claw-free graph is Hamiltonian) and by Thomassen (every 4-connected line graph is Hamiltonian) are equivalent. We show the above conjectures are equivalent with the conjecture by Jackson (every 2-connected claw-free graph has a Tutte cycle).

- 5 Norio Konno (Yokohama Nat. Univ.)[#] The graph isomorphism problem and quantum walk 15
 Iwao Sato (Oyama Nat. Coll. of Tech.)

Summary: We present an explicit formula for the characteristic polynomial of the transition matrix of the discrete-time quantum walk on a graph via the second weighted zeta function. As applications, we obtain new proofs for the results on spectra of the transition matrix and its positive support.

- 6 Iwao Sato (Oyama Nat. Coll. of Tech.)[#] Weighted zeta functions for quotients of regular coverings of graphs
 Seiya Negami (Yokohama Nat. Univ.) 15

Summary: We reformulate Stark and Terras' Galois Theory for a quotient H of a regular covering K of a graph G by using voltage assignments. As applications, we show that the weighted Bartholdi L -function of H associated to the representation of the covering transformation group of H is equal to that of G associated to its induced representation in the covering transformation group of K . Furthermore, we express the weighted Bartholdi zeta function of H as a product of weighted Bartholdi L -functions of G associated to irreducible representations of the covering transformation group of K .

- 7 Hye Jin Jang (POSTECH)[#] On fat Hoffman graphs with smallest eigenvalue at least -3 10
 Jack Koolen (POSTECH)
 Akihiro Munemasa (Tohoku Univ.)
 Tetsuji Taniguchi
 (Matsue Coll. of Tech.)

Summary: Hoffman graphs are a limiting object of graphs with respect to the smallest eigenvalue. To understand graphs with smallest eigenvalue -3 , we investigate fat Hoffman graphs with smallest eigenvalue at least -3 , using their special graphs. We show that the special graph $\mathcal{S}(\mathfrak{H})$ of an indecomposable fat Hoffman graph \mathfrak{H} is represented by the standard lattice or a root lattice. Moreover, we show that if the special graph admits an integral representation, that is, the lattice spanned by it is not an exceptional root lattice, then the special graph $\mathcal{S}^-(\mathfrak{H})$ is isomorphic to one of the Dynkin graphs A_n, D_n , or extended Dynkin graphs \tilde{A}_n or \tilde{D}_n .

- 8 Chie Nara (Tokai Univ.)[#] Refold rigidity of convex polyhedra 15
 Jin-ichi Itoh (Kumamoto Univ.)
 Erik D. Demaine (MIT)
 Martin L. Demaine (MIT)
 Anna Lubiw (Univ. Waterloo)
 Joseph O'Rourke (Smith Coll.)

Summary: We show that every convex polyhedron may be unfolded to one planar piece, and then refolded to a different convex polyhedron. If the unfolding is restricted to cut only edges of the polyhedron, then the dodecahedron is "edge-unfold rigid" in the sense that all of its 43,380 edge unfoldings may only fold back to the dodecahedron. We begin the exploration of which polyhedra are edge-unfold rigid, identifying one infinite rigid class, perturbed dodecahedra, and one infinite nonrigid class: tetrahedra.

- 9 Kazuhiko Ushio (Kinki Univ.)[#] Balanced (C_7, C_{12}) -foil designs and related designs 15

Summary: In graph theory, the decomposition problem of graphs is a very important topic. Various type of decompositions of many graphs can be seen in the literature of graph theory. This paper gives balanced (C_7, C_{12}) -foil designs and related designs.

14:15–16:40

- 10 Yutaka Sueyoshi (Nagasaki Univ.)[#] On a construction of equitable round-robin tournaments with home-
 Ryuichi Harasawa (Nagasaki Univ.) away assignments 20
 Aichi Kudo (Nagasaki Univ.)

Summary: We study the mathematical structure of equitable round-robin tournaments with home-away assignments, and give some necessary conditions for the feasibility of home-away tables, by using their friend-enemy tables and break interval sequences. These conditions are variants of Miyashiro–Iwasaki–Matsui’s necessary conditions. We examine the relation of these conditions, and enumerate the feasible break interval sequences and the corresponding home-away tables. For example, we can determine all the feasible home-away tables of equitable round-robin tournaments satisfying both the opening and the closing conditions, up to 26 teams.

- 11 Yasuo Katsumata (Asia Univ.)^{*} Analysis of a fuzzy Shapley value and its application 10
 Sakae Tsuda (Kokugauin High School)
 Kenichi Nagashima (Waseda Univ.)
 Hajime Yamashita (Waseda Univ.)

Summary: We would introduce a fuzzy relation among the players of coalitional game and regard the whole of coalitional game as a fuzzy graph. More over, we would present a fuzzy Shapley value ratio and a fuzzy Shapley value by using the value of coalition.

- 12 Hiromasa Nakayama [#] Holonomic gradient descent method for the Fisher–Bingham distribu-
 (Kobe Univ./JST CREST) tion on the n -dimensional sphere 15
 Tamio Koyama (Kobe Univ.)
 Kenta Nishiyama
 (Osaka Univ./JST CREST)
 Nobuki Takayama (Kobe Univ.)

Summary: We apply the holonomic gradient descent method to the maximal likelihood estimate (MLE) with respect to the Fisher–Bingham distribution on the n -dimensional sphere. We derive a Pfaffian system and a series expansion associated to the normalization constant. These enable us to solve some MLE problems up to $n = 7$.

- 13 Myoungnyoun Kim (NIMS)[#] Improving reconstruction image using weighted voxel specific signal-to-
 Tae Young Ha (NIMS) noise ratios in MREIT 15
 Eung Je Woo (Kyung-Hee Univ.)
 Oh In Kwon (Konkuk Univ.)

Summary: We present a new denoising technique to improve the resulting reconstruction image using weighted voxel specific signal-to-noise rations of multiple magnetic flux density signals from ICNE Multi-Echo in MREIT.

- 14 Hidehiro Shinohara (Tohoku Univ.)[#] Square Lehman matrices which are not cores of minimally non-ideal
 clutters 15

Summary: A clutter is called ideal if its associated blocking polyhedron is integral. Since ideality is a hereditary property, it is natural to characterize by minimal forbidden minors. The class of Lehman matrices is an essential class of 0-1 matrices in order to minimally non-ideal clutters, although Cornuejols conjectured that most of Lehman matrices are not cores of minimally non-ideal clutters, no example are known. We show the first example of an infinite family of square thin Lehman matrices which are not cores of minimally non-ideal clutters.

- 15 Akira Saito (Nihon Univ.)[#] Star-factors with large components 15
 Mikio Kano (Ibaraki Univ.)

Summary: For a set \mathcal{H} of connected graphs, a spanning subgraph H of a graph G is said to be an \mathcal{H} -factor if each component of H is isomorphic to some member of \mathcal{H} . Amahashi and Kano (1982) proved that a graph G satisfying $i(G - S) \leq m|S|$ for every $S \subset V(G)$ has a $\{K_{1,l} : 1 \leq l \leq m\}$ -factor, where $i(G - S)$ is the number of isolated vertices in $G - S$. But this result can be obtained as a corollary of Lovász' (g, f) -factor theorem. In this talk, we give a sufficient condition for a graph to have a $\{K_{1,l} : m \leq l \leq 2m\}$ -factor. Our result is also described in terms of $i(G - S)$, but since small stars are excluded from the set, we believe that it is not deduced from the (g, f) -factor theorem.

- 16 Kenta Noguchi (Keio Univ.)[#] Relations between current graphs, voltage graphs and cycle parities 15

Summary: We consider even embeddings of graphs. An even embedding of a graph on a closed surface is a fixed 2-cell embedding such that each face is bounded by a closed walk of even length. Even embeddings of graphs are classified by cycle parities, which are characteristics of even embeddings. A current graph is an embedded weighted directed graph which generates another embedded graph. A voltage graph is a dual of a current graph. In this talk, we explain how to decide a type of the cycle parities on an even embedding of a graph which is generated by a current graph or a voltage graph.

- 17 Kenta Ozeki (Nat. Inst. of Information)[#] Hamiltonicity of k -prism, a k -tree, a k -walk and a k -cycle cover of graphs 15

Summary: For a graph G , a k -tree is a spanning tree of G with maximum degree at most k , and a k -walk is a spanning closed walk in which every vertex is visited at most k times. A k -cycle cover is a set of at most k subgraphs of G such that each of the subgraphs is a cycle or K_2 and each vertex of G is contained in at least one of the subgraphs. A k -prism of G is the Cartesian product of G and the complete graph of order k . I will show the relationship among the existence of the first three structures and the existence of Hamilton cycles in the k -prism, and also consider sufficient conditions.

16:50–17:50 Talk invited by Applied Mathematics Section

- Yusuke Suzuki (Niigata Univ.)[#] 1-embedded graphs as seen from a viewpoint of re-embedding structures

Summary: In most cases in topological graph theory, we consider graphs on surfaces with no crossing of edges. Generally, these graphs on surfaces get along with Graph Minor Theory and many results in this field depend on it. However, it is known that 1-embedded graphs defined as graphs on surfaces with at most one crossing per edge cannot be treated by those techniques, and few control methods are known about these graphs (since the class of 1-embedded graphs on a surface is not closed under the edge-contraction). In this talk, we introduce the results on these 1-embedded graphs on surfaces studied from a view point of re-embedding structure of graphs. This talk is divided into four parts. At first, we introduce some terminologies of 1-embedded graphs on surfaces and define the notion of maximality for these graphs. (Especially, a 1-embedded (resp. 1-embeddable) graph on the plane or the sphere is called a 1-plane (resp. 1-planar) graph.) Secondly, we consider the number of edges of maximal 1-plane and maximal 1-planar graphs. Next, we introduce the results of re-embeddings of 1-planar graphs with maximum number of edges. Finally, we talk about re-embeddings of 1-embedded graphs on non-spherical surfaces with restricted structures.

September 19th (Wed) Conference Room VI

9:30–12:15

- 18 Shunji Horiguchi [#] Convergence comparison in the conditional expressions II of Tsuchikura–Horiguchi’s method (Yoshimasu Murase–Newton type’s first enhancing recurrence formula) 15
 (Niigata Sangyo Univ.)

Summary: Tsuchikura–Horiguchi’s method is an enhancing recurrence formula of Newton’s method. We will give a general convergence comparison with a conditional expression, a convergence comparison with a conditional expression of curvature of curve, and a convergence comparison with a conditional expression of concave and convex of curve.

- 19 Shunji Horiguchi [#] Numerical computations concerning elementary functions of a general convergence comparison in the conditional expression II of Tsuchikura–Horiguchi’s method 15
 (Niigata Sangyo Univ.)

Summary: We will give numerical computations concerning elementary functions of a general convergence comparison in the conditional expression II of Tsuchikura–Horiguchi’s method.

- 20 Yuji Katsuta (Ube Nat. Coll. of Tech.) [#] An analysis of a eight-order nonlinear symmetrical differential equation with dihedral group D_4 and odd function 20
 George Miyake (Ube Nat. Coll. of Tech.)

Summary: Through investigating conditions of a ring of four coupled identical cells with odd function, requirements for the presence of hyperbolic and non-hyperbolic solution are studied. Specifications for the presence of stable hyperbolic four phase periodic solutions with odd function are also learned.

- 21 Hirotake Yaguchi (Mie Univ.) ^{*} Construction and security of hash functions based on β -transformations on $[1,2)$ 15

Summary: We construct hash functions MBnhash ($n = 32, 160, 192, \dots, 1024, 2048$) using β -transformations on $[1,2)$ which are defined by $M_\beta(t) = bt \pmod{[1,2)}$, $b > 1$. We show that the security of the hash functions is reduced to solving algebraic equation of high degree.

- 22 Shy-Der Lin ^{*} Particular solutions of associated Cauchy–Euler fractional partial differential equation 15
 (Chung Yuan Christian Univ.)
 Chia-Hung Lu (Chung Yuan Christian Univ.)

Summary: In recent years, various operators of fractional calculus (that is, calculus of integrals and derivatives of arbitrary real or complex orders) have been investigated and applied in many remarkably diverse fields of science and engineering. Many authors have demonstrated the usefulness of fractional calculus in the derivation of particular solutions of a number of linear ordinary and partial differential equations of the second and higher orders. The purpose of the report is to present one kind of particular solutions of associated Cauchy–Euler fractional partial differential equation of arbitrary real or complex orders and their applications.

23 Noppharat Chaifong (Chuo Univ.)[#] A dynamical model of human immune response to two type influenza virus infections 15

Summary: A dynamical model of influenza virus replication in human epithelial cells for a spread of two diseases by effects of two type of influenza virus A, we developed a simplified dynamical model, which focuses on the control of the infection by innate and adaptive immunity. Innate immunity is represent by interferon-induced resistance to infection of respiratory epithelial cells and by removal of infected cells by effector cells. Adaptive immunity is represented by virus specific antibodies. This model is constructed as a system of 14 ordinary differential equations with 37 parameters. The parameters are derived from published experimental data.

24 Eunok Jung (Konkuk Univ.)[#] Mathematical models of circulatory systems 15
 Wanho Lee (Konkuk Univ.)
 Yongsam Kim (Chung-Ang Univ.)

Summary: In this talk we present two computational models of circulatory system: first, a mathematical model of left heart governed by the partial differential equations is introduced. This heart is coupled with a lumped model of the whole circulatory system governed by the ordinary differential equations. The immersed boundary method is used to investigate the intracardiac blood flow and the cardiac valve motions of the normal circulation in humans. We investigate the intraventricular velocity field and th e velocity curves over the mitral ring and across outflow tract. The pressure and flow are also measured in the left and right heart and the systemic and pulmonary arteries. Second, flows driven by pumping without valves are observed, motivated by biomedical applications: cardiopulmonary resuscitation (CPR) for the thoracic pump model and the human fetus before the development of the heart valves. Although the mechanism of valveless pumping (VP) has been discussed over the centuries, lots of phenomena of VP are still remained mysterious. In this talk, we present the various types of models in a VP system: a zero dimensional lumped model, two-dimensional models in an open tube and a closed loop system, a three-dimensional model of VP. The flow mechanism around a loop of tubing or open systems is investigated when an asymmetric force is applied in the valveless circulatory systems. In all models, we present that the direction and magnitude of a net flow are dependent on the parameters, such as frequency, amplitude, and compression duration. We also present how a net flow in VP can be obtained.

25 Jeongwhan Choi (Korea Univ.)[#] Supercritical surface waves generated by a negative or oscillatory forcing
 Shu-Ming Sun (Virginia PolyTech) 15
 Sungim Whang (Ajou Univ.)

Summary: We study forced furface waves on an incompressible, inviscid fluid in a two-dimensinal channel with a small negative or oacillatory bump on a rigid flat bottom. Such wave motions are determined by a nondimensional wave speed F , called Froude number, and $F = 1$ is a critical value of F . Here, we consider the case that F is slightly greater than 1. Forced K-dV equation is derived and studied mathematically and numerically. Existence theorems are proved and new types of numerical solutions are also found.

26 Prashant Kumar (POSTECH)[#] Mathematical modelling of the ship hydrodynamics in Pohang New Harbor 15
 Kim Kwang Ik (POSTECH)

Summary: The Pohang New Harbor (PNH), which is located at the southeastern part of the South Korea, has experienced seasonal extreme wave hazards of about 3.0-5.0 meter high in surface elevation owing to the wave induced oscillations. A systematically theoretical study on the basis of the linearized approximation for small amplitude theory derived the Helmholtz equation is proposed to investigate wave-induced oscillations with irregular harbor geometry for moored ship motion. We couple the six different mode of ship motions with the wave hydrodynamics to analyze the surge, sway, heave, roll, pitch and yaw motions in both the PNH as well as the modified PNH. The numerical simulation results are compared the modified PNH with original PNH.

September 20th (Thu) Conference Room VI

9:30–12:00

27 Kiyohisa Tokunaga (Fukuoka Inst. of Tech.)[#] The curl theorem of a triangular integral 15

Summary: As the foundation of double integral, we propose a triangular integral, which is an antisymmetric double integral by single limit of double dependent sums of triangularly divided areas. Extending integrand from scalar function to tensor one, we derive the curl theorem based on this triangular double integral. It is derived by substituting the total differentials in the transformation lemma, which is based on this triangular double integral. We may thus infer that this triangular integral is the inverse operation of the total differential.

28 Yoshihiro Saito (Gifu Shotoku Gakuen Univ.)[#] Numerical asymptotic stability of the θ -Maruyama simplified scheme 15

Summary: Numerical asymptotic stability of the θ -Maruyama simplified scheme for stochastic differential equations is discussed. We study asymptotic stability of θ -Maruyama simplified scheme with a random variable that matches the first three moments of the normal random variable. In this talk three types of the random variable will be treated.

29 Shingo Saito (Kyushu Univ.)^{*} Relation between the premium principle based on Wang’s transform and the Hermite polynomials 10

Summary: Wang proposed a premium principle based on what is now called Wang’s transform. I will discuss the relation between the premium principle and the Hermite polynomials.

30 Koya Sakakibara (Meiji Univ.)[#] A new method approximating holomorphic functions by linear combinations of $1/(z - \zeta)$ I —Analysis in an elliptic domain— 15

Summary: We consider approximating holomorphic functions by linear combinations of $1/(z - \zeta_k)$ using the charge simulation method. CSM is a fast solver of a Dirichlet problem for the Laplace equation and achieve an exponential decay of the error if we choose collocation points and charge ones suitably and if the boundary function is smooth enough. In our research, we consider a function f which is holomorphic in an elliptic domain Ω and continuous on the closure $\bar{\Omega}$. If we choose collocation points and charge ones by using the Joukowski transformation, we could prove the unique existence of an approximate function and an exponential decay of the error when f is holomorphic in a neighborhood of Ω .

- 31 Koya Sakakibara (Meiji Univ.)[#] A new method approximating holomorphic functions by linear combinations of $1/(z - \zeta)$ II —Analysis in an annular domain— 15

Summary: We consider approximating holomorphic functions by linear combinations of $1/(z - \zeta_k)$ using the charge simulation method (CSM, shortly). CSM is a fast solver of a Dirichlet problem for the Laplace equation and achieve an exponential decay of the error if we choose collocation points and charge ones suitably and if the boundary function is smooth enough. In our research, we consider a function f which is holomorphic in an annular domain Ω and continuous on the closure $\bar{\Omega}$. If we use the uniform and concentric arrangement of collocation points and charge ones, we could prove the unique existence of an approximate function and an exponential decay of the error when f is holomorphic in a neighborhood of Ω .

- 32 Shingo Iwami (Kyushu Univ.)[#] Modeling acute phase of viral infection 20

Summary: I will show how we can quantify acute phase of viral infection using mathematical modeling and experimental data. Applying quasi-steady state approach and exponential function approximation, we can derive an analytical solution of non-linear ODE. The analytical approximation captured the acute viral infection dynamics and estimated several important parameters.

- 33 Michiel Bertsch (Univ. Rome Tor Vergata)[#] Traveling wave solutions arising in a tumour growth model with contact inhibition 15

Danielle Hilhorst (Univ. de Paris-Sud)
 Hirofumi Izuhara (Meiji Univ.)
 Masayasu Mimura (Meiji Univ.)
 Tohru Wakasa (Kyushu Inst. of Tech.)

Summary: In this presentation, we consider a tumour growth model with contact inhibition. In particular, we discuss traveling wave solutions in the model. It is known that there are two types of traveling wave solution, say segregated and overlapping traveling wave solutions. We will present the feature of these traveling wave solutions.

- 34 Tatsuki Mori (Ryukoku Univ.)[#] Numerical study on stationary solutions and the stability of a 2d SKT cross-diffusion equation 15

Summary: We consider a cross-diffusion equation proposed by Shigesada–Kawasaki–Teramoto in 1979. Recently, Lou–Ni–Yotsutani have obtained mathematical results on the existence and the local stability of stationary solutions including multi-dimensional case under some special conditions. We numerically investigate the existence and the global stability under various general conditions in 2-dimensional case.

14:15–16:40 Special Session —Medicine and Mathematics—

Yasushi Okada (RIKEN)[#] Understanding the functions of biological molecular motors through modeling 45

Summary: Molecular motors play essential roles as logistics in our body. For example, some molecular motors transport materials within the neurons in our brain. The materials such as proteins, lipids and mRNAs are transported along filamentous structures, just like the cars are running along the highways. Learning, memory and even the survival of the neurons themselves depend on this transport. Recently, various neurodegenerative diseases such as Alzheimer’s disease are related to the problems in this transport or the “traffic jam”. In the first half of my talk, I will show our results on the mechanisms of this transport, which can be modeled as a flush ratchet type Brownian movement. This model was further extended to the formation of traffic jam. In the second half of my talk, I will show another interesting example of the function of molecular motors. We have recently demonstrated that the initial break of the left right symmetry of our body is triggered by the molecular motors, and that this event can be clearly explained by the mathematical model based on the fluid mechanics.

Motohisa Osaka (Nippon Veterinary and Life Sci. Univ.)[#] Applied mathematics on sudden cardiac death and rhythm 45

Summary: Recently we have reported that a previously unidentified V-trough of sympathetic nerve activity (SNA) is a potential precursor of lethal cardiac events by examining 24-hour ambulatory electrocardiograms in which such an event was recorded by chance. The V-trough was marked by 3 consecutive compartments: a small variation lasting 2 hours, an abrupt descent lasting 30 minutes, and a sharp ascent for 40 minutes. We reported that the hemodynamics consisting of heart rate, SNA and blood pressure (BP) is modeled excellently by modification of a known chaotic electrical circuit, Chua circuit. A V-trough of SNA appears by increasing the resistive element between SNA and BP in the circuit, which corresponds to the impaired regulation of BP by SNA. This finding is consistent with an acknowledged finding that the depressed baroreflex (reflex of BP by SNA) may trigger a lethal arrhythmia.

Jun-ichi Okada (Univ. of Tokyo)[#] Multiscale multiphysics heart simulator based on finite element method 45

Summary: We introduce the human heart simulator based on finite element method incorporating the propagation of excitation, the excitation-contraction coupling mechanisms and the fluid-structure interaction involved in the contraction and relaxation of the heart. The simulator successfully reproduced the clinical observation of the body surface potential distribution, the pressure volume histories of ventricle and the biphasic filling flow consisting of early rapid filling and atrial contraction. In the presentation, we will demonstrate the examples of clinical application of the drags discovery, the prediction of arrhythmia risk and the patient specific simulation for cardiac resynchronization therapy (CRT).

16:50–17:50 Talk invited by Applied Mathematics Section

Yuji Kodama (Ohio State Univ.)[#] KP solitons and Mach reflection in shallow water

Summary: This talk gives a survey of our recent studies on soliton solutions of the Kadomtsev–Petviashvili equation with an emphasis on the Mach reflection problem in shallow water.

September 21st (Fri) Conference Room VI

9:00–12:00

- 35 Junichi Nakagawa (Nippon Steel Corp.)[#] Evolution of local maximums of non-symmetric solutions to some reaction-diffusion systems 10
 Gen Nakamura (Hokkaido Univ.)
 Satoshi Sasayama (Hokkaido Univ.)
 Haibing Wang (Hokkaido Univ.)

Summary: We will propose one method which enables to express some solution of some reaction-diffusion system which is a simplified model of the sintering process of iron core. We simplified the conventional system of the sintering process to two components system with the Arrhenius terms. Our system is derived after approximating the Arrhenius terms by a piecewise linear function. For our system we can obtain a travelling like solution whose maximum value can increase a little bit. Especially, we are interested in a speed of maximum point for the moving solution. We study this speed by using “Microscopic scaling” and “Asymptotic analysis”.

- 36 Kazumi Tanuma (Gunma Univ.)^{*} Perturbation of phase velocity of Rayleigh waves and Stoneley waves in anisotropic elastic media with orthorhombic principal part 15
 Chi-Sing Man (Univ. of Kentucky)
 Wenwen Du (Univ. of Kentucky)

Summary: Rayleigh waves are elastic surface waves which propagate along the traction-free surface with the phase velocity in the subsonic range, and whose amplitude decays exponentially with depth below that surface. We present a first-order perturbation formula for the phase velocity of Rayleigh waves that propagate along the free surface of a homogeneous anisotropic elastic half-space. The perturbation formula expresses the shift of phase velocity of Rayleigh waves from its corresponding value for the comparative orthorhombic medium, caused by the perturbative part of the elasticity tensor and by the initial stress. We consider the same problem for Stoneley waves in bonded anisotropic elastic half-spaces. We discuss the inverse problem to determine the initial stress by measurement of phase velocities of those waves.

- 37 Nobuyuki Higashimori[#] A direct numerical method for solving the initial boundary value problem of the three dimensional radiative transport equation 15
 (Hitotsubashi Univ.)
 Hiroshi Fujiwara (Kyoto Univ.)

Summary: We propose a direct numerical method to solve the initial boundary value problem for the three dimensional radiative transport equation instead of widely used indirect methods, e.g., diffusion approximation or the Monte Carlo method. We apply the first order upwind finite difference approximation to the differential terms of the transport equation, and the composite trapezoidal rule to the integral term. We also give examples of numerical solution of an initial boundary value problem.

- 38 Xiao-Yu Zhang[#] Effective condition numbers of finite difference methods for elliptic equations with singularities 15
 (Beijing Forestry Univ./Yamagata Univ.)
 Qing Fang (Yamagata Univ.)

Summary: In this talk we consider the Dirichlet boundary value problem of elliptic equation involving the boundary singularities by the finite difference method. The numerical solution converges to the exact solution both by numerical analysis and numerical experiments. But the traditional condition number of the discrete system is significantly large which could not explain the convergence of the approximate solution. We study effective condition numbers and derive their bounds which are much smaller. The results show that the finite difference method is effective for our singular problems and effective condition numbers can be considered as better measures than the traditional condition number.

- 39 Masashi Katsurada (Meiji Univ.)[#] Eigenvalue problems of the biharmonic operator in a square region
 Yuki Hirano (Anjo Higashi High School) —Finite difference analysis of chladni figures— 15

Summary: We consider eigenvalue problems of the biharmonic operator Δ^2 in a square region $\Omega = (0, 1) \times (0, 1)$ whose boundary condition is that of “free edges”. A finite difference scheme is introduced, and we make numerical computations and compare the results with the physical experiments by Marry D. Waller (1939).

- 40 Kaname Matsue (Tohoku Univ.)[#] Rigorous numerical verification of saddle-saddle connections 20
 Nobito Yamamoto
 (Univ. of Electro-Comm.)

Summary: We show a new approach to verify connecting orbits in dynamical systems which are structurally unstable, saddle-saddle connections. Our method consists of two parts, “near to saddle” and “global part”. The analysis near to saddle is based on Lyapunov function method, which is similar to topological tool called covering relations but our method is much simpler than them. As for the global part, the Lohner’s method which is well-known for rigorous computations of initial value problems is used. Our method is so simple that we believe that our method can be extended to various applications.

- 41 Tomohiro Hiwaki[#] Numerical verification of a domain included by the basin of a limit cycle
 (Univ. of Electro-Comm.) 20
 Nobito Yamamoto
 (Univ. of Electro-Comm.)

Summary: There are a lot of works on dynamical systems using validated numerics, e.g. P. Zgliczyński, et al. However only few works dealt with numerical verification of the basin of a fixed point including one of the authors’ work. In this paper we propose a numerical verification method of a domain which is included by the basin of a limit cycle, as well as the existence of the limit cycle. Introducing a modified Poincare Mapping, we derive a verification condition for the domain in the basin which can be verified by computers. Numerical examples will be shown in the talk.

- 42 Takehiko Kinoshita (Kyoto Univ.)[#] A numerical verification method for solutions of IVP for ODEs using a
 Takuma Kimura (Waseda Univ.) linearized inverse operator 15
 Mitsuhiro T. Nakao
 (Sasebo Nat. Coll. of Tech.)

Summary: We propose a new verification method to enclose solutions for initial value problems of systems of first-order nonlinear ordinary differential equations (ODEs) using a linearized inverse operator. The proposed approach can verify the existence and local uniqueness of the exact solution independent of the choice of the approximation scheme, while the existing methods usually depend on the numerical scheme for the approximate solution.

14:15–16:30

- 43 Yoshitaka Watanabe (Kyushu Univ.)[#] A numerical verification of the invertibility of linear operators with
 Mitsuhiro T. Nakao inverse norm estimations 15
 (Sasebo Nat. Coll. of Tech.)

Summary: A self-validating numerical method which proves the invertibility of infinite dimensional linear operators with its norm bounds is proposed. It is based on a Newton-like formulation and finite dimensional singular value approximations. Some verification results will be shown.

- 44 Kenta Kobayashi (Hitotsubashi Univ.)[#] The circumradius condition on triangular elements and its applications
 Takuya Tsuchiya (Ehime Univ.) 20

Summary: In error analysis of the finite element methods, it is important to estimate error of the piecewise linear interpolation of sufficiently smooth function on triangular elements. In the talk, the authors explain a newly obtained error estimation under the circumradius condition on triangular elements. The authors also present applications of the circumradius condition.

- 45 Fumio Kikuchi [#] Strong L^p convergence associated with Rellich-type discrete compact-
 (Hitotsubashi Univ./Univ. of Tokyo) ness for discontinuous Galerkin FEM 20
 Daisuke Koyama
 (Univ. of Electro-Comm.)

Summary: In a preceding paper, we proved the discrete compactness properties of Rellich type for some 2D discontinuous Galerkin finite element methods (DGFEM), that is, the discrete analogs of strong L^2 convergence of some subfamily of a H^1 bounded family, as well as weak H^1 convergence. In this note, we will show the strong L^p convergence of the above subfamily for $1 \leq \forall p < \infty$. For such a purpose, we utilize regularity properties of some auxiliary boundary value problems. The results can be effectively used for numerical analysis of various semilinear problems.

- 46 Daisuke Koyama [#] An optimized Schwarz method for acoustic radiation problems 20
 (Univ. of Electro-Comm.)

Summary: In [Domain Decomposition Methods in Science and Engineering XIX (2010) 351–358], we proposed a parallel Schwarz method for multiple scattering problems, and proved the convergence of the method in proper Sobolev spaces. However, the convergence is very slow in numerical experiments. So we need to accelerate the convergence speed of the method. As an acceleration methods, we have the optimized Schwarz method (OSM) proposed by Gander et al. [SIAM J. Sci. Comput. 24 (2002) 38–60], who investigated the OSM for the Helmholtz problem in bounded domains. We investigate an OSM for the exterior Helmholtz problem, and give a procedure to get the optimal parameter in the OSM.

- 47 Hirofumi Notsu (Waseda Univ.)[#] Error estimates of a pressure-stabilized characteristics finite element
 Masahisa Tabata (Waseda Univ.) scheme for the Oseen equations 20

Summary: Error estimates of a pressure-stabilized characteristics finite element scheme for the Oseen equations are presented. Although the system of the equations is linear, the estimate for the pressure is not obvious. A similar analysis is required for a pressure-stabilized characteristics finite element scheme for the Navier–Stokes equations.

- 48 Hiroshi Kanayama (Kyushu Univ.)[#] Domain decomposition computation of thermal convection problems
 based on the characteristic curve method 20

Summary: A coupling analysis of thermal convection problems is performed in this work. The most attractive advantage of the characteristic curve (CC) method is the symmetry of the linear system, which enables some symmetric linear iterative solvers, like the conjugate gradient (CG) method, to be used to solve the interface problem of the domain decomposition system. In order to implement a coupling analysis of the Navier–Stokes problem and the convection-diffusion problem, the CC method is applied to both parts, and results of searching for elements in each non-stationary loop are shared by both. The code has been developed under the hierarchical domain decomposition system, and comparison between iterative solvers based on the CG method and the minimal residual (MINRES) method for the interface problem has also been done.

16:45–17:45 Talk invited by Applied Mathematics Section

Daisuke Tagami (Kyushu Univ.)[#] Numerical analysis of flow problems with finite element methods —From error analysis to parallel computations—

Summary: The reliability and the applicability of numerical schemes are important concerns in various fields. Until now, we have focused on the ones of finite element methods for flow problems. As the reliability, we have established optimal error estimates of finite element methods for Navier–Stokes equations and thermal convection equations. Moreover, we have established optimal error estimates of the boundary flux, drag, lift, and thermal balances, related with the above equations. As the applicability, we have applied iterative domain decomposition methods into stationary and nonstationary Navier–Stokes equations. Moreover, we have computed actual models such as a subway station model with the parallel computations.

We continue here to establish of optimal error estimates and to compute with parallel computations in case of such as viscoelastic flows. First, we establish optimal error estimates of finite element methods for 3-field Stokes equations, which are well-known as one of simple models to viscoelastic flows. Next, we show some numerical results with finite element computations of the 4-to-1 contraction flow, which is well-known as one of accuracy verification problems.

Topology

September 18th (Tue) Conference Room IX

9:15–12:00

- 1 Masayuki Kawashima [#] On torus decompositions and line degenerated torus curves 10
 (Tokyo Univ. of Sci.)

Summary: Let $C = \{f = 0\}$ be an affine plane curve. We are interested in a form of the defining polynomial f . In this talk, we study line degenerated torus curves. Line degenerated torus curves are divided into two types which are called visible or invisible degenerations. We construct a pair of plane curves of degree $2p - 2$ such that they have the same singularities. If p is even, their complements in \mathbb{P}^2 have different topologies.

- 2 Misako Yokoyama (Shizuoka Univ.) [#] Finding a system of essential 2-suborbifolds 15
 Yoshihiro Takeuchi
 (Aichi Univ. of Edu.)

Summary: We make an analogy of Culler–Morgan–Shalen theory. Our main goal is to show that there exists a non-empty system of essential 2-suborbifolds respecting a given splitting of the orbifold fundamental group.

- 3 Selman Akbulut (Michigan State Univ.) ^{*} Gluck twisting 4-manifolds with odd intersection form 10
 Kouichi Yasui (Hiroshima Univ.)

Summary: We show that, for any compact simply connected smooth 4-manifold with an odd intersection form, the Gluck twisting along an embedded 2-sphere does not change its diffeomorphism type under a mild homological condition on the 2-sphere (e.g. to be null-homologous). We also discuss the non simply connected case.

- 4 Takuya Sakasai (Univ. of Tokyo) [#] The abelianization of the symplectic derivation Lie algebra of the free
 Masaaki Suzuki (Akita Univ.) associative algebra 15
 Shigeyuki Morita (Univ. of Tokyo)

Summary: We determine the abelianization of the symplectic derivation Lie algebra of the free associative algebra. As an application using a theorem Kontsevich, we obtain a new proof of the vanishing theorem of Harer concerning the top rational cohomology group of the mapping class group with respect to its virtual cohomological dimension.

- 5 Kazuki Toda (Univ. of Tokyo) ^{*} The second cohomology of the homological Goldman Lie algebra 10

Summary: We can construct a Lie algebra from the first homology group of an oriented surface and its intersection form. We call it the homological Goldman Lie algebra of the first homology group. The algebra reflects the topological structure of the surface. We determine the second homology group of the homological Goldman Lie algebra. In particular, the dimension of the homological Goldman Lie algebra is finite if the surface is closed.

6 Nariya Kawazumi (Univ. of Tokyo)[#] On the Turaev cobracket and the Morita traces 20
 Yusuke Kuno (Tsuda Coll.)

Summary: We compute the principal term of the Laurent expansion of the Turaev cobracket of the completed Goldman–Turaev Lie bialgebra on a compact connected oriented surface with connected boundary. As a corollary, we derive all the Morita traces of the Johnson cokernel of the Torelli group of the surface from the fundamental fact that any diffeomorphism of a surface preserves the self-intersection of any curves on the surface.

7 Jong Bum Lee (Sogang Univ.)[#] The geometry of Sol^3 15

Summary: We classify all the closed 3-dimensional orbifolds with Sol-geometry. These are aspherical orbifolds and so their fundamental groups, called SC-groups, determine the orbifolds completely. Thus we will classify all the SC-groups, together with all the SB-groups, up to affine diffeomorphism. Using elements of group theoretical nature we will be able to write down faithful representations in the affine group $\text{Aff}(\mathbb{R}^3)$ for these groups.

8 Suyoung Choi (Ajou Univ.)[#] Rational homology of real toric variety over graph associahedra 15
 Hanchul Park (Ajou Univ.)

Summary: Given a finite graph G , the graph associahedron $P_{\mathcal{B}(G)}$ is a simple, convex polytope whose face poset is based on the connected subgraphs of the graph G . For instance, a permutohedron and a Stasheff polytope are examples of graph associahedra corresponding to a complete graph and a path, respectively. It is well-known that they support many interesting real toric varieties. Recently, Henderson computed the rational homology of real Hessenberg variety supported by a permutohedron using geometrical way, and, later, A. Suciuc computed it again using new method in toric theory. In this paper, we generalize their result to all graph associahedra.

9 Junhui Kim (Wonkwang Univ.)[#] A non-2-starcompact Tychonoff space whose hyperspace is 2-starcompact 15

Summary: The purpose of this talk is to discuss which star covering properties of $H(X)$ (or $C(X)$) can be transferred to X , where star coverings are properties located between countable compactness and pseudocompactness.

14:15–16:00

10 Kenshi Ishiguro (Fukuoka Univ.)[#] Pairings and monomorphisms of classifying spaces 10
 Shotaro Kudo (Fukuoka Univ.)
 Tomohiro Nakano
 (Wajiro Junior High School)

Summary: We consider the pairing problems of maps between classifying spaces of compact Lie groups. If one of the restriction maps is a weak epimorphism, then the other is known to factor through the classifying spaces of the center of the compact Lie group. Replacing the weak epimorphism by a monomorphism, analogous results are obtained.

- 11 Tomohisa Inoue (Shinshu Univ.)[#] The 31-stem homotopy groups of 9 and 10-dimensional spheres 10
 Juno Mukai (Matsumoto Univ.)

Summary: Group structures of 2-primary components of homotopy groups of spheres were studied by Toda with his composition method. Several researchers followed the method and Oda showed structures of 25 to 31-stem homotopy groups in 1979. There are, however, two incompletely determined groups in 31-stem. One is that of 9-dimensional sphere, and the other is that of 10-dimensional sphere. Our investigation gives group structures of them and we outline a proof of the result in this presentation. We use Toda’s composition method to determine these groups.

- 12 Ippei Ichigi (Kochi Nat. Coll. of Tech.) The homotopy groups of a type two spectrum grading over the Picard
 Katsumi Shimomura (Kochi Univ.) group of \mathcal{L}_2 15
 Yutaro Terahara (Kochi Univ.)

Summary: Let V denote the cofiber of $\alpha^2: \Sigma^8 M \rightarrow M$ for the mod three Moore spectrum M and the Adams map α . Consider the Bousfield localization functor $L_2: \mathcal{S} \rightarrow \mathcal{L}_2$ from the stable homotopy category of spectra localized at the prime three to the one of spectra localized with respect to $v_2^{-1}BP$. Then, the Picard groups of \mathcal{L}_2 consisting of invertible spectra in it is determined to be the direct sum of \mathbb{Z} and two copies of $\mathbb{Z}/3$. In this talk, we report the structure of grading homotopy groups $\pi_*(L_2V)$ over the Picard group.

- 13 Takahito Naito (Shinshu Univ.)[#] String topology on rational Gorenstein spaces 15

Summary: Chas and Sullivan introduced a commutative and associative product which is an intersection type on the homology of the free loop space of any closed oriented manifold. Cohen and Godin generalized the product and showed that the homology has the structure of a commutative Frobenius algebra without counit. Recently, Félix and Thomas develop string topology on Gorenstein spaces. In this talk, I will see that the homology of the free loop space of a rational Gorenstein space is a Frobenius algebra without unit and counit.

- 14 Ryo Kato (Nagoya Univ.)[#] On the generalized retract conjecture 10
 Katsumi Shimomura (Kochi Univ.)
 Yutaro Tatehara (Kochi Univ.)

Summary: For any pointed symmetric monoidal category, we can define the Bousfield lattice of it. In particular, the Bousfield lattice of a category of spectra was deeply analyzed by Hovey–Palmieri. In the work, they proposed a conjecture (called the retract conjecture). This conjecture can be generalized for any stable homotopy category, and Dwyer and Palmieri showed that there is a stable homotopy category such that the retract conjecture doesn’t hold. Recently we extended their work and found many useful results for the generalized retract conjecture. In this talk, we will introduce them.

- 15 Tadayuki Haraguchi (Okayama Univ.)^{*} Model structure of numerically generated spaces 15

Summary: Let NG denote the full subcategory of Top consisting of numerically generated spaces. In this talk, we report that the category NG has a model structure with respect to which NG and Top are a Quillen equivalence.

16:20–17:20 Talk invited by Topology Section

Toshio Sumi (Kyushu Univ.)* The Smith equivalence problem and Smith sets of Oliver groups

Summary: Let G be a finite group. Two real G -modules U and V are called *Smith equivalent* if there exists a smooth action of G on a homotopy sphere Σ such that $\Sigma^G = \{x, y\}$, and $T_x(\Sigma)$ (resp. $T_y(\Sigma)$) is isomorphic to U (resp. V). If Σ^P is connected for any subgroup P of G of prime power order, then we call that U and V are *c-primary Smith equivalent*.

Atiyah and Bott (resp. Sanchez) showed that any Smith equivalent real modules for a cyclic group of prime (resp. of odd prime power) order are isomorphic. Cappell and Shaneson showed that there exists a pair of non-isomorphic Smith equivalent real modules for any cyclic group of order $4n \geq 8$, and Dovermann and Petrie showed that there exists infinitely many cyclic groups of odd order of which there is a pair of non-isomorphic Smith equivalent real modules. Furthermore, there exist such finite abelian groups given by Dovermann and Suh. For a perfect group G , Laitinen and Pawałowski showed that there exists a pair of non-isomorphic c-primary Smith equivalent real G -modules if and only if the number r_G of real conjugacy classes of elements of G not of prime power is greater than or equal to 2. Pawałowski and Solomon showed that for a gap Oliver group G with $r_G \geq 2$ except two groups, there exists a pair of non-isomorphic c-primary Smith equivalent real G -modules. Morimoto determined that for one of the two groups, any Smith equivalent real modules are isomorphic but for the another group, there exists a pair of non-isomorphic c-primary Smith equivalent real modules. Many researchers have studied the related problem.

In this talk, we discuss finite groups possessing a pair of non-isomorphic Smith equivalent real modules and the set of c-primary Smith equivalent real modules.

September 19th (Wed) Conference Room VIII + IX

10:50–11:50 Award Lecture for 2012 Geometry PrizeKen'ichi Ohshika (Osaka Univ.)[#] Topological structure of deformation spaces of Kleinian groups

Summary: In the theory of Kleinian groups, now the attention is focused on studying topological structure of deformation spaces of Kleinian groups after big problems like tameness conjecture and the ending lamination conjecture were solved. In this talk, I shall discuss recent progresses in studies of the deformation spaces and my work on the boundaries of these spaces.

13:15–14:15 Award Lecture for 2012 Geometry PrizeYukinobu Toda (Univ. of Tokyo)[#] Stability conditions and Donaldson–Thomas type invariants on Calabi–Yau 3-folds

Summary: Donaldson–Thomas (DT) invariants were introduced by Richard Thomas in 1998, and they count holomorphic vector bundles (more precisely stable coherent sheaves) on Calabi–Yau 3-folds. The rank one DT invariants count holomorphic curves in X , and are conjectured to be equivalent to the Gromov–Witten invariants by Maulik–Nekrasov–Okounkov–Pandharipande. In this talk, I will survey my work on the generalization of DT invariants counting certain stable objects in the derived category of coherent sheaves, and their wall-crossing formula. I will show that the wall-crossing formula of our DT type invariants establish several new formulas of the generating series of the original DT invariants, and solve several open problems in DT theory related to the MNOP conjecture.

9:30–11:45

- 16 Takuji Nakamura * The state numbers of plane curves and knots 10
 (Osaka Electro-Comm. Univ.)
 Yasutaka Nakanishi (Kobe Univ.)
 Shin Satoh (Kobe Univ.)
 Yumi Toyama (Kobe Univ.)

Summary: The states of a knot projection are used for calculation of the Jones polynomial by the Kauffman bracket model. For each $n > 0$, the n -state number of a classical (or virtual) knot K is the minimal number of the states with n circles for all possible classical (or virtual) projections of K . We denote it by $s_n^c(K)$ (or $s_n^v(K)$). We will study several properties of the state numbers such as relationships between $s_1^c(K)$ and the determinants, $s_1^c(K)$ and $s_2^c(K)$, $s_1^v(K)$ and the Miyazawa polynomial, and so on. As a corollary, we will determine the state numbers of the trefoil knot.

- 17 Reiko Shinjo (Waseda Univ.)[#] On the inclusive relation of three properties of knot diagrams 10
 Kokoro Tanaka (Tokyo Gakugei Univ.)

Summary: We consider three properties of knot diagrams. We investigate into the inclusive relation of the three properties and complete the Venn diagram of them.

- 18 Kokoro Tanaka (Tokyo Gakugei Univ.)[#] Interpretation of rack coloring knot invariants in terms of quandles
 Yuma Taniguchi (Tokyo Gakugei Univ.) 15

Summary: It is known that racks give us invariants of oriented framed knots and quandles give us that of oriented knots. Considering an oriented knot with an integer as the oriented framed knot, Nelson constructed an invariant of (unframed) oriented knots by using rack coloring invariants. It is natural to consider whether there is some relationship between his invariant and an invariant of oriented knots derived from quandle theory. In this talk, we give two interpretation of his invariant in terms of quandles.

- 19 Masao Hara (Tokai Univ.)[#] On Jones polynomials of alternating pretzel knots 10
 Makoto Yamamoto (Chuo Univ.)

Summary: We show that there are infinitely many pairs of alternating pretzel knots whose Jones polynomials are identical.

- 20 Atsuhiko Mizusawa (Waseda Univ.)[#] Yokota type invariants for oriented spatial graphs derived from Costantino–Murakami’s invariants 15

Summary: We construct invariants for oriented spatial graphs whose vertices have more or equal to 3 edges. These invariants are defined by using Costantino–Murakami’s invariants for oriented framed 3-valent spatial graphs and the method used to define Yokota’s invariants for spatial graphs having multi-valent vertices. We calculate some examples, which show non-triviality of these invariants.

- 21 Kenta Okazaki (Kyoto Univ.)[#] On the Turaev–Viro–Ocneanu invariants of 3-manifolds associated with the E_6 and E_8 subfactor planar algebras 10

Summary: The Turaev–Viro–Ocneanu invariants are invariants of closed oriented 3-manifolds associated with type II_1 subfactors, and are defined by taking the sum over all of the “state” of a simplicial decomposed 3-manifold.

On the other hand, the notion of a planar algebra was proposed by Jones, which enables to handle complicated computations related with type II_1 subfactors.

In this talk we combinatorially reconstruct the Turaev–Viro–Ocneanu invariants from the E_6 and E_8 subfactors without the knowledge of subfactors by using the idea of planar algebras. In construction, we define “partition function” of closed planar tangles, and we give simple objects of the planar algebras in an explicit form.

- 22 Inasa Nakamura (Gakushuin Univ.)[#] Unknotting numbers and triple point cancelling numbers of torus-covering knots 10

Summary: It is known that any surface knot can be transformed to an unknotted surface knot or a surface knot which has a diagram with no triple points by a finite number of 1-handle additions. The minimum number of such 1-handles is called the unknotting number or the triple point cancelling number respectively. In this paper, we give upper bounds and lower bounds of unknotting numbers and triple point cancelling numbers of torus-covering knots, which are surface knots in the form of coverings over the standard torus T . Upper bounds are given by using m -charts on T presenting torus-covering knots, and lower bounds are given by using quandle colorings and quandle cocycle invariants.

- 23 Yeonhee Jang (Nara Women’s Univ.)[#] Distance of bridge presentations of links and essential surfaces in the link exteriors 15

Summary: Bachman and Schleimer gave an upper bound for the distance of a bridge surface of a knot in a 3-manifold which admits an essential surface in the exterior. We give a sharper upper bound for the distance of a bridge surface of a link in case where it admits an essential meridional sphere in the exterior.

14:15–15:40

- 24 Kengo Kishimoto (Osaka Inst. of Tech.)[#] Simple ribbon fusions for links II 10
 Tetsuo Shibuya (Osaka Inst. of Tech.)
 Tatsuya Tsukamoto
 (Osaka Inst. of Tech.)

Summary: A simple ribbon fusion is a special kind of fusion for a link. We give infinitely many ribbon knots which are not obtained from the trivial knot by simple ribbon fusions. We also give an inequality between the h -complexities of two links such that one is obtained from the other by a simple ribbon fusion. This is a joint work with T. Shibuya and T. Tsukamoto.

- 25 Tetsuya Abe (Kyoto Univ.)[#] Annulus twists and diffeomorphic 4-manifolds 15
 In Dae Jong (Osaka Pref. Univ.)

Summary: We give a new method for obtaining infinitely many framed knots which represent a diffeomorphic 4-manifold. Our key tools are an annulus twist which was introduced by Osoinach and a band presentation. As an application, we obtain a method for constructing a homotopy 4-sphere from a ribbon knot with unknotting number one.

26 Tetsuya Abe (Kyoto Univ.)[#] Omae’s knot and 12_{a990} are ribbon 15
 Motoo Tange (Univ. of Tsukuba)

Summary: The purpose of this talk is twofold: First, we prove that Omae’s knot is ribbon, which was known to be homotopically slice. Second, we give a sufficient condition for a given knot to be ribbon. As a corollary, we show that the knot 12_{a990} is ribbon, which was known to be slice.

27 Yuichi Yamada (Univ. of Electro-Comm.)[#] Divide knot presentations of sporadic knots of Berge’s lens space surgery 10

Summary: Dehn surgery along a (hyperbolic) knot yielding a lens space is called lens space surgery. We study knots in the third family named “sporadic examples” in Berge’s list of lens space surgery. It is shown that every knot is a divide knot, defined by A’Campo in singularity theory. A plane curve presentation (a generalized L-shaped curve) as a divide knot is given.

28 Motoo Tange (Univ. of Tsukuba)[#] Primitive/Seifert knots in the Poincaré homology sphere 15

Summary: We will give an infinite family of knots with primitive/Seifert positions in Poincare homology spheres. These knots can give rises to Seifert fibered spaces by integral Dehn surgeries. These Seifert fibered spaces are all L-spaces but not spherical manifolds except some finite cases. We describe other Seiferters in the Poincare homology sphere.

16:00–17:00 Talk invited by Topology Section

Koya Shimokawa (Saitama Univ.)[#] Tangle analysis of site-specific recombinations

Summary: In 1990, Ernst and Sumners introduced the tangle method to analyze the mechanism of site-specific recombinations of DNA.

In 2007, Grainge *et al.* showed that, when coupled with FtsK, the site-specific recombinases XerC/XerD can unlink DNA catenanes $2m$ -cat ($T(2, 2m)$) and proposed a stepwise model of unlinking: $T(2, 2m), T(2, 2m - 1), \dots, T(2, 2)$, the unknot, the unlink. In this talk, we show that their model is the only pathway from the $2m$ -cat to the unlink when we assume that each recombination event reduces the crossing number. We also characterize shortest pathways from the 6-cat ($T(2, 6)$) to the unlink under the assumption that the crossing number does not increase at each event.

September 21st (Fri) Conference Room IX

9:15–12:00

29 Yusuke Mizota (Kyushu Univ.)[#] Explicit construction of generators for the module of liftable vector fields 15

Summary: The notion of liftable vector fields was introduced by Arnol’d for studying bifurcations of wave front singularities. Liftable vector fields is defined for a multigerms $f : (K^n, S) \rightarrow (K^p, 0)$ ($K = R$ or C) and have various applications. The module of vector fields liftable over f is denoted by L_f and when $n < p$, to the best of my knowledge, there seems to have been few general results. Nishimura gave, in principle, a method to construct generators for L_f when $n \leq p$ in some conditions. However, it is difficult to obtain generators by hand by his method. We give a method to find polynomial liftable vector fields and obtain explicit generators by a computer.

- 30 Masaru Kada (Osaka Pref. Univ.)[#] Galois–Tukey connection involving order structures of metrics 20
 Yasuo Yoshinobu (Nagoya Univ.)

Summary: Kada proved in a previous paper (Topology Appl., 2009) that the collection of compatible metrics on a locally compact separable metrizable space has the same cofinal type, in the sense of Tukey relation, as the set of functions from ω to ω with respect to eventually dominating order. By generalizing this result, we characterize the order structure of the collection of compatible metrics on a separable metrizable space in terms of generalized Galois–Tukey connection.

- 31 Hanbiao Yang (Univ. of Tsukuba)* Metrization of function spaces with the Fell topology 10

Summary: For a Tychonoff space X , let $\downarrow C_F(X)$ be the family of hypographs of all continuous maps from X to $[0, 1]$ endowed with the Fell topology. It is proved that X has a dense separable metrizable locally compact open subset if $\downarrow C_F(X)$ is metrizable. Moreover, for a first-countable space X , $\downarrow C_F(X)$ is metrizable if and only if X itself is a locally compact separable metrizable space. There exists a Tychonoff space X such that $\downarrow C_F(X)$ is metrizable but X is not first-countable.

- 32 Katsuhisa Koshino (Univ. of Tsukuba)* Characterizing infinite-dimensional manifolds and its applications 15

Summary: For an infinite cardinal τ , let $\ell_2^f(\tau)$ be the linear span of the canonical orthonormal basis of the Hilbert space $\ell_2(\tau)$ with weight $= \tau$. In this research, we give characterizations of topological manifolds modeled on $\ell_2^f(\tau)$ and $\ell_2^f(\tau) \times \mathbf{Q}$, where $\mathbf{Q} = [-1, 1]^{\mathbb{N}}$ is the Hilbert cube. Furthermore, we characterize topological manifold pairs modeled on $(\ell_2(\tau), \ell_2^f(\tau))$ and $(\ell_2(\tau) \times \mathbf{Q}, \ell_2^f(\tau) \times \mathbf{Q})$. We denote the full simplicial complex with cardinality $= \tau$ and the hedgehog with weight $= \tau$ by $\Delta(\tau)$ and $J(\tau)$, respectively. Using these characterizations, we prove that the pairs $(cl|\Delta(\tau)|, |\Delta(\tau)|_m)$ and $(J(\tau)^{\mathbb{N}}, J(\tau)_f^{\mathbb{N}})$ are homeomorphic to $(\ell_2(\tau), \ell_2^f(\tau))$.

- 33 Jun Yagi (Kochi Univ.)[#] The topology of a model for ringed hydrocarbon molecules 15
 Satoru Goto (Tokyo Univ. of Sci.)
 Yutaka Hemmi (Kochi Univ.)
 Kazushi Komatsu (Kochi Univ.)

Summary: As a mathematical model of n -membered ringed hydrocarbon molecules, we consider closed chains in \mathbf{R}^3 . By K. Komatsu and S. Goto, so far, it was shown that the configuration space C_n of the model at the standard bond angle is homeomorphic to $(n - 4)$ -dimensional sphere S^{n-4} when $n = 5, 6, 7$. In this talk, by using the proof, we give a proof that for a bond angle θ in $\frac{n-4}{n-2}\pi < \theta < \frac{n-2}{n}\pi$ the configuration space C_n of the model is homeomorphic to $(n - 4)$ -dimensional sphere S^{n-4} when $n = 5, 6, 7$. If time allows, we will talk about the configuration space C_8 of the model with the standard bond angles.

- 34 Akihiro Higashitani (Osaka Univ.)[#] Lattice multi-polygons 15
 Mikiya Masuda (Osaka City Univ.)

Summary: We discuss generalizations of some results on lattice polygons to certain piecewise linear loops which may have a self-intersection but have vertices in the lattice \mathbb{Z}^2 . That is to say, we introduce the notion of lattice multi-polygons which is a generalization of lattice polygons. We then prove the generalized twelve-point theorem, state the generalized Pick’s formula and discuss the classification of Ehrhart polynomials of lattice multi-polygons and also of several natural subfamilies of lattice multi-polygons.

- 35 Takami Sato (Hokkaido Univ.)[#] Curves on a spacelike surface in three dimensional Lorentz–Minkowski space 10

Summary: In this talk, we consider curves on a spacelike surface in Lorentz–Minkowski 3-space. We introduce new geometric invariants for these curves. As an application of the unfolding theory of functions, we investigate the local and global properties of these invariants.

- 36 Shin Kiriki (Kyoto Univ. of Edu.)[#] Existence of generic cubic homoclinic tangencies for Hénon maps 15
Teruhiko Soma (Tokyo Metro. Univ.)

Summary: We show that the Hénon map $\varphi_{a,b}$ has a generically unfolding cubic tangency for some (a, b) arbitrarily close to $(-2, 0)$. Combining this fact with previous results by some authors, one can observe the new phenomena in the Hénon family, appearance of persistent antimonotonic tangencies and cubic polynomial-like strange attractors.

- 37 Toshikazu Ito (Ryukoku Univ.)^{*} Degeneracy locus of critical points of the distance function on a holomorphic foliation 10
Bruno Scárdua (Univ. Fed. Rio de Janeiro)
Yoshikazu Yamagishi (Ryukoku Univ.)

Summary: We study the geometry of transversality of holomorphic foliations of codimension one in \mathbb{C}^n with spheres, from a viewpoint of dynamics of anti-holomorphic maps in the projective space. A point of non-degenerate contact of a leaf with a sphere is a hyperbolic fixed point of the corresponding dynamics. Around a point of degenerate contact, the intersection of branches of the variety of contacts is described as a bifurcation diagram of a neutral fixed point of dynamics. The Morse index for the distance function from the origin is computed as the complex dimension of an unstable manifold.

Infinite Analysis

September 18th (Tue) Conference Room VII

9:30–11:45

- 1 Kazuo Kaneko (Yokkaichi Univ.)* Special solutions to the four dimensional Painlevé type equations 21, 21, 111, 111 and 31, 22, 22, 1111 15

Summary: The four dimensional Painlevé type equation 21, 21, 111, 111 and 31, 22, 22, 1111 are both derived as extensions of the sixth Painlevé equation. The first one is found by K. Fuji and T. Suzuki from the similarity reduction of the Drinfel'd Sokolov hierarchy and derived by T. Tsuda from UC hierarchy. The second one is found by Y. Sasano from the generalization of the space of the initial condition of the sixth Painlevé equation. Both are derived by H. Sakai from the monodromy preserving deformation of the Fuchs type linear equation. We will clarify the differences between both by investigating the meromorphic solutions around the singularities.

- 2 Seiji Nishioka (Yamagata Univ.)# Approximation of Poincaré's new functions by rational functions 15

Summary: In 1890, Poincaré introduced a new class of meromorphic functions. He studied systems of multiplicative difference equations (in other words, q -difference equations) with certain conditions, and constructed their meromorphic function solutions. In this talk, I will introduce a method of approximating those functions.

- 3 Yoshikatsu Sasaki (Hiroshima Univ.)# Third-degree superintegrable system solved by the sixth Painlevé transcendents 15

Summary: P. Winternitz and one of his coworkers obtained a superintegrable system written by the sixth Painlevé transcendents with three of the four monodromy exponents. R. Conte and the speaker believe; if it is a good problem, then the sixth Painlevé transcendents should appear with full parameters. So we tried and found the solution with the fourth parameter by use of the symmetry of the sixth Painlevé equation.

- 4 Hajime Nagoya (Kobe Univ.)# Realizations of affine Weyl group symmetries on the quantum Painlevé equations by fractional calculus 15

Summary: We realize affine Weyl group symmetries on the Schrödinger equations for the quantum Painlevé equations, by fractional calculus. This realization enables us to construct an infinite number of hypergeometric solutions to the Schrödinger equations for the quantum Painlevé equations.

- 5 Hajime Nagoya (Kobe Univ.)# Symmetries of quantum Lax equations for the Painlevé equations 15
Yasuhiko Yamada (Kobe Univ.)

Summary: The Painlevé equations can be written as Hamiltonian systems with affine Weyl group symmetries. A canonical quantization of the Painlevé equations preserving the affine Weyl group symmetries has been studied. While, the Painlevé equations are isomonodromic equations for certain second-order linear differential equations. In this paper, we introduce a canonical quantization of Lax equations for the Painlevé equations and construct symmetries of the quantum Lax equations.

6 Koji Hasegawa (Tohoku Univ.)[#] Lax form for quantum discrete Painlevé VI equation 20

Summary: A discretization of Painlevé VI equation was obtained by Jimbo and Sakai in 1996. There are two ways to quantize it:

- 1) use the affine Weyl group symmetry (of $D_5^{(1)}$)
- 2) Lax formalism i.e. monodromy preserving point of view.

Both approaches are successful and give the same quantization. We will also report the Weyl group action for the latter approach.

7 Gen Kuroki (Tohoku Univ.)[#] Sato–Wilson formalisms for quantum birational Weyl group actions of type A 30

Summary: The birational Weyl group actions arising from nilpotent Poisson algebras of types A_{n-1} , A_∞ , and $A_{n-1}^{(1)}$ and their τ -functions are canonically quantized and deformed to the q -difference analogues. The Lax and the Sato–Wilson formalisms for the q -difference versions of the quantized birational Weyl group actions are presented.

14:15–14:45

8 Edwin Langmann (Roy. Inst. of Tech. Sweden)[#] Source identity and kernel functions for Inozemtsev-type systems 15
 Kouichi Takemura (Chuo Univ.)

Summary: We present kernel functions for Inozemtsev Hamiltonians. To obtain them, we introduce the source identity. An application to integral transformations of Inozemtsev systems is given.

9 Masatoshi Noumi (Kobe Univ.)[#] Bispectral problem for the Ruijsenaars–Macdonald q -difference operators
 Jun’ichi Shiraishi (Univ. of Tokyo) 15

Summary: We present a direct approach to the bispectral problem associated with the Ruijsenaars–Macdonald q -difference operators of GL type. We give an explicit construction of meromorphic solutions, and discuss their basic properties, including the divisor of poles, symmetries and recursive structure described in terms of Jackson integrals or q -difference operators.

15:00–16:00 Talk invited by Infinite Analysis Special Session

Junichi Shiraishi (Univ. of Tokyo)[#] Vertex operators, Nekrasov partition functions and Macdonald polynomials

Summary: We study a certain family of Fock representations for the quantum algebra introduced by Ding–Iohara and Miki. The trivalent intertwining operators are identified with the so called refined topological vertex of Iqbal–Kozcaz–Vafa, thereby establishing the connection between the Nekrasov partition functions and the quantum algebra. We show that certain matrix elements of the intertwining operators are the solution to the bispectral problem associated with the Ruijsenaars–Macdonald q -difference operators.

September 19th (Wed) Conference Room VII

10:30–11:50

- 10 Taichiro Takagi [#] Commuting time evolutions in the tropical periodic Toda lattice ····· 15
 (Nat. Defense Acad. of Japan)

Summary: The tropical (ultradiscrete) periodic Toda lattice is a dynamical system derived from a time-discretized version of the periodic Toda lattice through a limiting procedure called tropicalization. We propose a new formulation for this dynamical system with a representation by two-colored strips. Based on this formulation, a family of its commuting time evolutions is constructed.

- 11 Atsuo Kuniba (Univ. of Tokyo) [#] Tetrahedron equation and quantum R matrices for spin representations
 Sergey Sergeev (Univ. of Canberra) ····· 10

Summary: It is known that a solution of the Zamolodchikov tetrahedron equation generates infinitely many solutions of the Yang–Baxter equation via suitable reductions. We apply this scheme to a q-oscillator solution of the tetrahedron equation by using special 3d boundary conditions. The resulting solutions of the Yang–Baxter equation are identified with the quantum R matrices for the spin representations of $B_n^{(1)}$, $D_n^{(1)}$ and $D_{n+1}^{(2)}$.

- 12 Ryosuke Kodera (Kyoto Univ.) * Self-extensions and prime factorizations for simple $U_q(L\mathfrak{sl}_2)$ -modules
 ····· 15

Summary: I discuss a conjectural relationship between the dimension of the self-extension group for a finite-dimensional simple module over a quantum loop algebra and the number of prime factors of it. This gives a refinement of a recent result and conjecture by Chari–Moura–Young.

- 13 Jun Murakami (Waseda Univ.) [#] Quantum $6j$ -symbols for non-integral highest weight representations of
 $\mathcal{U}_q(\mathfrak{sl}_2)$ at root of unity ····· 15

Summary: With F. Costantino, we obtain the quantum Crebsch–Gordan coefficients and the quantum $6j$ -symbols for non-integral highest weight representation of $\mathcal{U}_q(\mathfrak{sl}_2)$ at root of unity. We explain applications for invariants of spacial graphs, the colored Alexander invariants and the hyperbolic volume of a truncated tetrahedron.

- 14 Motohiro Ishii (Univ. of Tsukuba) [#] Path model for representations of generalized Kac–Moody algebras ··· 15

Summary: A. Joseph and P. Lamprou (2009) generalized Littelmann’s path model to the case of generalized Kac–Moody algebras. We show that Joseph–Lamprou’s path model can be embedded into Littelmann’s path model for a certain Kac–Moody algebra constructed from a root datum of a given generalized Kac–Moody algebra. By using this embedding, we give some applications to representation theory of generalized Kac–Moody algebras.

13:30–14:30 Talk invited by Infinite Analysis Special SessionYoshiyuki Kimura (Osaka City Univ.)[#] Quiver varieties and quantum cluster algebras

Summary: Cluster algebras were introduced by Fomin and Zelevinsky with an aim to provide concrete and combinatorial formalism for the study of Lusztig’s dual canonical basis and total positivity. Inspired by a previous work of Nakajima, we consider a class of perverse sheaves on acyclic graded quiver varieties and study the Fourier–Sato–Deligne transform from a representation theoretic point of view. In particular, we identify the quantum cluster character with the truncated t -analogue of q -character via the Fourier–Sato–Deligne transform. We obtain deformed monoidal categorifications of acyclic quantum cluster algebras with specific coefficients, that is the ring isomorphism between the quantum cluster algebra and the quantum Grothendieck ring which sends the quantum cluster monomials into the basis of simple modules (“dual canonical basis”). As a corollary, the positivity conjecture is verified whenever there is an acyclic seed in the quantum cluster algebra. After certain cocycle twisting, we prove that the quantum cluster monomials belong to the dual canonical basis of the quantum unipotent subgroup associated with the square of an acyclic Coxeter element. This talk is based on a joint work with Fan Qin (Université Paris Diderot, Paris 7, Institute de Mathématiques de Jussieu).