update: February 6, 2020

The 15th East Asian Conference on Geometric Topology

February 10–13, 2020
RIMS, Kyoto University, Japan

http://www.kurims.kyoto-u.ac.jp/~eacgt/

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Welcome to

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Welcome to RIMS, Kyoto University, Japan. The purpose of the conference is to help promoting the academic exchange and the friendship among researchers of three East Asian countries in the area of geometric topology and encouraging graduate students of the three countries to study in this fascinating area of mathematics.

This conference is supported by the following:

Research Institute for Mathematical Sciences, Kyoto University
JSPS, Grant-in-Aid for Scientific Research (S) : JP15H05739
JSPS, Grant-in-Aid for Scientific Research (A) : JP16H02145
JSPS, Grant-in-Aid for Scientific Research (B) : JP18H01119
JSPS, Grant-in-Aid for Scientific Research (B) : JP19H01788
JSPS, Grant-in-Aid for Scientific Research (C) : JP18K03306
JSPS, Grant-in-Aid for Scientific Research (C) : JP19K03490
JSPS, Grant-in-Aid for Exploratory Research : JP16K13754
JSPS, Grant-in-Aid for Exploratory Research : JP19K21830

We hope you will enjoy the conference.

Tomotada Ohtsuki
Chair

Contents

1. Information

Lecture rooms:
The plenary talks are given at Room 420 on the 4th floor. Parallel sessions take place in 3 rooms: Room 420, Room 111 and Room 110 (both Rooms 111 and 110 are on the 1st floor).

Registration:
When you arrive at the conference, please input your information (name, affiliation and email address) at one of the terminals at the backside of Rooms 420, 111 and 110. Furthermore, please take your name card and a copy of the booklet at the entrance of Room 420 (in front of the room or in the room).

To participants from China and Korea: Please go to Room 103 on the 1st floor at 13:00–14:00 on February 10th (Monday) to make the procedure of your visit. If you can not visit there at that time, please go to Room 104 (International Research Support Office (RIMS secretary)) on the 1st floor when you arrive at the conference.

To participants who attend banquets and/or excursion: Please go to Room 103 on the 1st floor at 13:00–14:00 on February 10th (Monday) to confirm your attendance of banquets and/or excursion. If you can not visit there at that time, please contact a local organizer when you arrive at the conference.

Internet connection:
The eduroam wireless network is available on site. If you have some problems related to eduroam, please contact your home institution's technical support.

Banquets:
We have banquets in the cafe restaurant *Camphora* at 17:00 on February 10th (Monday) and at 19:00 on February 13th (Thursday). We ask the participants of the banquets to go there at that time. For the location of *Camphora*, please see the map at the end of this booklet.

We ask the participants of the conference to arrange the other meals by yourself.

Excursion:
We have an excursion in the afternoon on February 13th (Thursday). We ask the participants of the excursion to go to the entrance of RIMS at 13:00 on February 13th (Thursday).

For further information, please see the conference web page:

`http://www.kurims.kyoto-u.ac.jp/~eacgt/`

2. **Talk Schedule**

February 10 (Monday)

	Room 420 (live streaming are available at Rooms 111 and 110)		
Chair	*Kazuo Habiro*		
9:50–10:30	Qingtao Chen		
10:50–11:30	Kokoro Tanaka		
11:30–13:00	Lunch		
	Room 103		
13:00–14:00	Registration		
	Room 420	Room 111	Room 110
Chair	*Shin Satoh*	*Jae Choon Cha*	*Toshie Takata*
14:00–14:20	Gyo Taek Jin	Ayumu Inoue	Marco De Renzi
14:25–14:45	Seungsang Oh	Min Hoon Kim	Hiroaki Karuo
14:45–15:15	Tea Time		
15:15–15:35	Seokbeom Yoon	Jun Ueki	Daiki Iguchi
15:40–16:00	Jung Hoon Lee	Takefumi Nosaka	Naoko Kamada
17:00–19:00	Banquet		

February 11 (Tuesday)

	Room 420	Room 111	Room 110
Chair	*Kazuto Takao*	*Wataru Yuasa*	*Naoko Kamada*
13:00–13:20	Katsumi Ishikawa	Ryoto Tange	Yuta Taniguchi
13:25–13:45	Kyungbae Park	María de los Angeles Guevara Hernández	Xinghua Gao
13:50–14:10	Shin Satoh	Eiko Kin	(blank)
14:10–14:40	Tea Time		
Chair	*Yasutaka Nakanishi*	*Kazuhiro Ichihara*	*Masaaki Suzuki*
14:40–15:00	Benjamin Bode	Ken'ichi Yoshida	Hyungkee Yoo
15:05–15:25	Seiichi Kamada	BoGwang Jeon	Tomo Murao

February 12 (Wednesday)

	Room 420 (live streaming are available at Rooms 111 and 110)		
Chair	*Seiichi Kamada*		
9:50–10:30	Taehee Kim		
10:50–11:30	Takahiro Oba		
11:30–13:00	Lunch		
	Room 420	Room 111	Room 110
Chair	*Tatsuro Shimizu*	*Katsumi Ishikawa*	*Eiko Kin*
13:00–13:20	Kazuhiro Ichihara	Wataru Yuasa	Yuka Kotorii
13:25–13:45	Anderson Vera	Airi Aso	Shosaku Matsuzaki
13:50–14:10	Delphine Moussard	Hideo Takioka	Robert Tang
14:10–14:40	Tea Time		
Chair	*Tetsuya Ito*	*Hirotaka Akiyoshi*	*Takahiro Oba*
14:40–15:00	Sungkyung Kang	Nobutaka Asano	Takuya Katayama
15:05–15:25	Jae Choon Cha	Kazuto Takao	Donggyun Seo

February 13 (Thursday)

	Room 420 (live streaming are available at Rooms 111 and 110)
Chair	*Taizo Kanenobu*
9:50–10:30	Toshie Takata
10:50–11:30	Inkang Kim
11:30–13:00	Lunch
13:00–19:00	Excursion
19:00–21:00	Banquet

3. Program

February 10 (Monday)

ROOM 420 (live streaming are available at Rooms 111 and 110)
Chair: Kazuo Habiro
9:50–10:30 **Qingtao Chen** (New York University Abu Dhabi)
Recent development of volume conjectures
10:50–11:30 **Kokoro Tanaka** (Tokyo Gakugei University)
Independence of Roseman moves for surface knots

ROOM 103
13:00–14:00 **Registration**

ROOM 420
Chair: Shin Satoh
14:00–14:20 **Gyo Taek Jin** (KAIST)
Minimal grid diagrams of 11 crossing prime alternating knots
14:25–14:45 **Seungsang Oh** (Korea University)
Quantum knot mosaics and bounds of the growth constant
15:15–15:35 **Seokbeom Yoon** (KIAS)
Adjoint Reidemeister torsions from wrapped M5-branes
15:40–16:00 **Jung Hoon Lee** (Jeonbuk National University)
On Casson–Gordon's rectangle condition for 3-bridge decompositions of knots

ROOM 111
Chair: Jae Choon Cha
14:00–14:20 **Ayumu Inoue** (Tsuda University)
The fibered knots whose knot quandles are finite
14:25–14:45 **Min Hoon Kim** (POSTECH)
Non-slice linear combinations of algebraic knots
15:15–15:35 **Jun Ueki** (Tokyo Denki University)
Profinite rigidity for twisted Alexander invariants
15:40–16:00 **Takefumi Nosaka** (Tokyo Institute of Technology)
K_1-valued Alexander polynomials of knots

ROOM 110

Chair: Toshie Takata

14:00–14:20 **Marco De Renzi** (Waseda University)
$2+1$-TQFTs from non-semisimple modular categories

14:25–14:45 **Hiroaki Karuo** (RIMS, Kyoto University)
On the reduced Dijkgraaf–Witten invariant of knots in the Bloch group of $\mathbb{F}_p$

15:15–15:35 **Daiki Iguchi** (Hiroshima University)
The Goeritz groups of bridge decompositions

15:40–16:00 **Naoko Kamada** (Nagoya City University)
On almost classical virtual links

17:00–19:00 **Banquet**

February 11 (Tuesday)

ROOM 420

Chair: Kazuto Takao

13:00–13:20 **Katsumi Ishikawa** (RIMS, Kyoto University)
Vanishing of open Jacobi diagrams with odd legs

13:25–13:45 **Kyungbae Park** (Seoul National University)
On definite fillings of lens spaces

13:50–14:10 **Shin Satoh** (Kobe University)
The 2-knots of triple point number four

Chair: Yasutaka Nakanishi

14:40–15:00 **Benjamin Bode** (Osaka University)
Knotted surfaces as algebraic varieties

15:05–15:25 **Seiichi Kamada** (Osaka University)
The motion group and the ring group of an H-trivial link and its application

ROOM 111

Chair: Wataru Yuasa

13:00–13:20 **Ryoto Tange** (Tokyo Denki University)
Non-acyclic SL_2-representations of twist knot groups and (-3)-Dehn surgeries

13:25–13:45 **María de los Angeles Guevara Hernández** (Osaka City University)
The braid alternation number and the braid dealternating number

13:50–14:10 **Eiko Kin** (Osaka University)
Problem on pseudo-Anosov minimal entropies

Chair: Kazuhiro Ichihara

14:40–15:00 **Ken'ichi Yoshida** (Saitama University)
Degeneration of 3-dimensional hyperbolic cone structures with decreasing cone angles

15:05–15:25 **BoGwang Jeon** (POSTECH)
Rigidity in hyperbolic Dehn fillings

ROOM 110

Chair: Naoko Kamada

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13:50–14:10 (blank)

Chair: Masaaki Suzuki

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February 12 (Wednesday)

ROOM 420 (live streaming are available at Rooms 111 and 110)
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Primary decomposition in knot concordance
10:50–11:30 **Takahiro Oba** (RIMS, Kyoto University)
Lefschetz–Bott fibrations and their applications to symplectic geometry

ROOM 420
Chair: Tatsuro Shimizu
13:00–13:20 **Kazuhiro Ichihara** (Nihon University)
Two-bridge knots admit no purely cosmetic surgeries
13:25–13:45 **Anderson Vera** (RIMS, Kyoto University)
Johnson-type homomorphisms and the Le–Murakami–Ohtsuki invariant
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Three-dimensional characterization of the slice genus of knots and links

Chair: Tetsuya Ito
14:40–15:00 **Sungkyung Kang** (Chinese University of Hong Kong)
Link homology theories and ribbon concordances
15:05–15:25 **Jae Choon Cha** (POSTECH)
Primary decomposition in low dimensional topology

ROOM 111
Chair: Katsumi Ishikawa
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The $\mathfrak{sl}_3$ colored Jones polynomial of a $(2, m)$-torus link and its tail
13:25–13:45 **Airi Aso** (Tokyo Metropolitan University)
Twisted Alexander polynomials of tunnel number one Montesinos knots
13:50–14:10 **Hideo Takioka** (Kyoto University)
Vassiliev knot invariants derived from cable Γ-polynomials

Chair: Hirotaka Akiyoshi
14:40–15:00 **Nobutaka Asano** (Tohoku University)
Vertical 3-manifolds in simplified genus 2 trisections of 4-manifolds
15:05–15:25 **Kazuto Takao** (Kyoto University)
Local theory of the graphic of two trisections of a 4-manifold

ROOM 110

Chair: Eiko Kin

13:00–13:20 **Yuka Kotorii** (RIKEN)

Levine's classification of 4-component links up to link-homotopy and its classification by claspers

13:25–13:45 **Shosaku Matsuzaki** (Takushoku University)

Oriented surfaces in the 3-sphere and their coloring invariants

13:50–14:10 **Robert Tang** (OIST)

Coarse and fine geometry of the saddle connection graph

Chair: Takahiro Oba

14:40–15:00 **Takuya Katayama** (Hiroshima University)

Embeddability between the right-angled Artin groups of surfaces

15:05–15:25 **Donggyun Seo** (Seoul National University)

Dehn twists, right-angled Artin subgroups and trees

February 13 (Thursday)

ROOM 420 (live streaming are available at Rooms 111 and 110)
Chair: Taizo Kanenobu

9:50–10:30 **Toshie Takata** (Kyushu University)
The strong slope conjecture for cablings and connected sums

10:50–11:30 **Inkang Kim** (KIAS)
New way of constructing mapping class group invariant Kähler metrics on Teichmüller space and the convexity of energy function

13:00–19:00 **Excursion**

19:00–21:00 **Banquet**

4. Abstracts

Plenary talks

Qingtao Chen *New York University Abu Dhabi*
Title: Recent development of volume conjectures
Abstract: The original Volume Conjecture of Kashaev–Murakami–Murakami predicts a precise relation between the asymptotics of the colored Jones polynomials of a knot in S^3 and the hyperbolic volume of its complement.

I will discuss two different directions that lead to generalizations of this conjecture. The first direction concerns different quantum invariants of knots, arising from the colored $SU(n)$ (with the colored Jones polynomial corresponding to the case $n = 2$). I will first display subtle relations between congruence relations, cyclotomic expansions and the original Volume Conjecture for colored Jones polynomials of knots. I will then generalize this point of view to the colored $SU(n)$ invariant of knots. Certain congruence relations for colored $SU(n)$ invariants, discovered in joint work with K. Liu, P. Peng and S. Zhu, lead us to formulate cyclotomic expansions and a Volume Conjecture for these colored $SU(n)$ invariants. I will also discuss similar ideas for the superpolynomials that arise in HOMFLY–PT homology. In fact, I proposed cyclotomic expansion conjectures and Volume conjectures for superpolynomials.

Another direction for generalization involves the Witten–Reshetikhin–Turaev and (modified) Turaev–Viro quantum invariants of 3-manifolds. In a joint work with T. Yang, we formulated a new Volume Conjecture for the asymptotics of these 3-manifolds invariants evaluated at certain roots of unit, and numerically checked it for many examples. Interestingly, this conjecture uses roots of unity that are different from the one usually considered in literature. This may indicate that the understanding of this new phenomenon requires new physical and geometric interpretations that go beyond the usual quantum Chern–Simons theory. I will also introduce a work on Krillov–Reshetikhin quantum 6j-symbols done by J. Murakami and me.

Inkang Kim *KIAS*
Title: New way of constructing mapping class group invariant Kähler metrics on Teichmüller space and the convexity of energy function
Abstract: In this talk, we introduce a new way of constructing Kähler metrics on Teichmüller space different from Weil–Petersson metric. This is done through the energy of harmonic maps. We also give some possible applications for higher Teichmüller theory. This is a joint work with Wan and Zhang.

Taehee Kim *Konkuk University*
Title: Primary decomposition in knot concordance
Abstract: I will address the conjecture that nonslice knots with coprime Alexander polynomials are not concordant. In particular, I will give evidence supporting the conjecture using various concordance invariants. A similar conjecture for smooth knot concordance and Jae Choon Cha's new framework on the study of primary decomposition in knot concordance, which includes the above conjecture, will also be discussed. This is joint work with Min Hoon Kim and Se-Goo Kim.

Takahiro Oba *RIMS, Kyoto University*
Title: Lefschetz–Bott fibrations and their applications to symplectic geometry
Abstract: A Lefschetz–Bott fibration can be viewed as a complex Morse–Bott function, and, in particular, a Lefschetz fibration is Lefschetz–Bott. As Lefschetz fibrations have played an important role in symplectic geometry, we expect Lefschetz–Bott fibrations to do that. In this talk, I will first give an overview of some aspects of Lefschetz–Bott fibrations. After this, I will explain their applications to symplectic geometry such as (strong) symplectic fillings of contact manifolds and symplectic mapping class groups.

Toshie Takata *Kyushu University*
Title: The strong slope conjecture for cablings and connected sums
Abstract: For a maximal set $\mathcal{K}$ of knots which satisfy the Strong Slope Conjecture and some additional conditions, we prove that $\mathcal{K}$ is closed under connected sums and cablings. In particular, we establish the Strong Slope Conjecture for graph knots. This is joint work with Kenneth L. Baker and Kimihiko Motegi.

Kokoro Tanaka *Tokyo Gakugei University*

Title: Independence of Roseman moves for surface knots

Abstract: Roseman moves are seven types of local modifications for (broken surface) diagrams in 3-space which generate ambient isotopies of surface links in 4-space. Independence of Roseman moves as local moves is already well understood. Then it is natural to ask what types should appear in any sequence of Roseman moves for two diagrams of a given surface knot. In this talk, we discuss independence of Roseman moves involving triple points and also independence of those involving branch points. The former is a joint work with Kengo Kawamura (Osaka City University) and Kanako Oshiro (Sophia University), and the latter is a joint work with Masamichi Takase (Seikei University).

Parallel Session

Nobutaka Asano *Tohoku University*

Title: Vertical 3-manifolds in simplified genus 2 trisections of 4-manifolds

Abstract: A trisection is a decomposition of a closed 4-manifold by 3 tuple of 4-dimensional 1-handlebodies, which was introduced by Gay and Kirby. They proved the existence of a trisection for any closed 4-manifold by using a stable map (called a trisection map) from the 4-manifold to $\mathbb{R}^2$. After their work, a simplified trisection was introduced by Baykur and Saeki. They proved the existence of a simplified trisection from a simplified broken Lefschetz fibration, by homotopies called Lekili moves. In this talk, using Lekili moves, we will give a classification of 3-manifolds that can be obtained as the preimages of arcs on $\mathbb{R}^2$ by simplified genus 2 trisection maps, which we call vertical 3-manifolds. The source 4-manifold that admits a given set of vertical 3-manifolds is also determined.

Airi Aso *Tokyo Metropolitan University*

Title: Twisted Alexander polynomials of tunnel number one Montesinos knots

Abstract: The twisted Alexander polynomial was introduced in 1990's as a generalization of the Alexander polynomial, which is one of the classical invariants of knots determined by the fundamental groups of the compliments of knots (i.e., knot groups). Since the twisted Alexander polynomial of a knot is determined by the knot group and their representation, it has more information than the classical Alexander polynomial. For example, Kinoshita–Terasaka and Conway's 11 crossing knots, which are not distinguished by their Alexander polynomials, are distinguished by their twisted Alexander polynomials.

The tunnel number of a knot K is the minimal number of mutually disjoint arcs τ_i in $S^3 \setminus K$ such that the component of an open regular neighborhood of $K \cup (\cup \tau_i)$ is a handlebody.

In this talk, we calculate the twisted Alexander polynomials of tunnel number one Montesinos knots associated to their $SL_2(\mathbb{C})$ representations.

Benjamin Bode *Osaka University*

Title: Knotted surfaces as algebraic varieties

Abstract: The loop braid group is the fundamental group of configurations of an unlink in $\mathbb{R}^3$, where each component lies in a plane parallel to a fixed plane. I will present an algorithm that constructs for every element B of the loop braid group a polynomial map $f : \mathbb{R}^5 \to \mathbb{R}^2$ such that $f^{-1}(0) \cap S^4$ contains the closure of B. Moreover, the algorithm provides an upper bound on the degree of the constructed polynomials. The construction can be generalized to certain elements of other motion groups. We also highlight applications in theoretical physics, in particular a step towards the construction of electromagnetic fields with closed (and potentially knotted) field lines, whose time evolution is described by the chosen element of the motion group.

Jae Choon Cha *POSTECH*

Title: Primary decomposition in low dimensional topology

Abstract: We introduce the notion of primary decomposition for various abelian groups which appear in the study of low dimensional topology, and discuss related conjectures and questions. Key examples include knot concordance groups and rational homology cobordism group of rational homology 3-spheres. For the case of the smooth concordance group of topologically slice knots, we show that there is a large subgroup which admits infinitely many primary factors each of which has infinite rank. This result exhibits the rich structure of the primary decompositions and provides evidences supporting the conjectures. Among the key ingredients of the proof, we use Cha–Orr's amenable L^2-signature theorem, Ozsvath–Szabo's inequality for definite 4-manifolds, and Némethi's work on Heegaard Floer homology of plumbed manifolds.

Xinghua Gao *KIAS*

Title: Orderability of Dehn fillings and the L-space conjecture

Abstract: Boyer, Gordon, and Watson conjectured that an irreducible rational homology 3-sphere is not an L-space if and only if its fundamental group is left-orderable (known as the L-space conjecture). In this talk, I will show how to prove left-orderability of a fundamental group by constructing $\widetilde{PSL}(2, \mathbb{R})$ representations.

María de los Angeles Guevara Hernández *Osaka City University*
Title: The braid alternation number and the braid dealternating number
Abstract: Alexander's theorem states that any link can be presented as a closed braid. However, there are alternating links that cannot be presented as an alternating closed braid. In this talk, we will introduce the braid alternation number and the braid dealternating number, which are invariants that measure how far the links are from being an alternating closed braid. Furthermore, we will show the value of these invariants for some knot families and the gap between their values. This is joint work with Akio Kawauchi.

Kazuhiro Ichihara *Nihon University*
Title: Two-bridge knots admit no purely cosmetic surgeries
Abstract: I will talk on cosmetic surgery on knots, i.e., pair of distinct Dehn surgeries produce 3-manifolds that are homeomorphic as oriented manifolds. Actually it will be shown that two-bridge knots and alternating fibered knots admit no purely cosmetic surgeries. This talk is based on a joint work with In Dae Jong, Thomas W. Mattman, and Toshio Saito.

Daiki Iguchi *Hiroshima University*
Title: The Goeritz groups of bridge decompositions
Abstract: For a bridge decomposition of a link in S^3, we define the Goeritz group to be the group of isotopy classes of orientation-preserving diffeomorphisms of S^3 that preserve the bridge sphere and link setwise. In this talk, we discuss properties of the group, such as the cardinality and the asymptotic behavior of the minimal pseudo-Anosov entropies. This is a joint work with S. Hirose, E. Kin and Y. Koda.

Ayumu Inoue *Tsuda University*
Title: The fibered knots whose knot quandles are finite
Abstract: Associated with any dimensional knot, we have its knot quandle in a similar manner to its knot group. Cardinalities of knot quandles can be finite, while those of knot groups are always infinite. In this talk, the speaker gives a necessary and sufficient condition for a fibered knot so that its knot quandle is finite. Especially, we obtain a complete list of classical knots whose twist-spinning have finite knot quandles.

Katsumi Ishikawa *RIMS, Kyoto University*
Title: Vanishing of open Jacobi diagrams with odd legs
Abstract: The space of open Jacobi diagrams $\mathcal{B}$ is a vector space generated by unitrivalent graphs and plays an important role in quantum topology. In particular, the vanishing of the odd-leg part of $\mathcal{B}$ is conjectured and from this conjecture it follows that the Kontsevich invariant of a knot does not depend on the orientation.

In this talk, we introduce recent results on this conjecture, including the vanishing of the odd-leg part up to loop degree 8.

BoGwang Jeon *POSTECH*
Title: Rigidity in hyperbolic Dehn fillings
Abstract: In this talk, I will discuss about a rigidity of core geodesics in hyperbolic Dehn fillings. For instance, for a given n-cusped hyperbolic 3-manifold M having non-symmetric cusp shapes, it is shown any Dehn filling of M with sufficiently large coefficient is uniquely determined by the product of the holonomies of its core geodesics.

Gyo Taek Jin *KAIST*
Title: Minimal grid diagrams of 11 crossing prime alternating knots
Abstract: The arc index of a knot is the length of a minimal arc presentation. An arc presentation of a knot can be shown in the form of a grid diagram which is a closed plane curve consisting of finitely many horizontal line segments and the same number of vertical line segments. The arc index of an alternating knot is its minimal crossing number plus two. In this talk, we list grid diagrams of the 11 crossing prime alternating knots obtained from minimal arc presentations which are of length 13. It is a joint work with Hwa Jeong Lee.

Naoko Kamada *Nagoya City University*
Title: On almost classical virtual links
Abstract: A virtual link diagram is said to be almost classical if it admits an Alexander numbering. All classical link diagrams are almost classical. In this talk we introduce a map from the set of virtual link diagrams to that of almost classical virtual link diagrams. It induces a well-defined map from the set of virtual links to that of almost classical virtual links.

Seiichi Kamada *Osaka University*
Title: The motion group and the ring group of an H-trivial link and its application
Abstract: An H-trivial link is a link which is equivalent to the split union of some Hopf links and a trivial link. We discuss the motion group and the ring group of an H-trivial link. It turns out that they are isomorphic. A generating set of the group is given. We also discuss applications to surface knot theory in 4-space. This is a joint work with C. Damiani and R. Piergallini.

Sungkyung Kang *Chinese University of Hong Kong*
Title: Link homology theories and ribbon concordances
Abstract: It was recently proved by several authors that ribbon concordances induce injective maps in knot Floer homology, Khovanov homology, and the Heegaard Floer homology of the branched double cover. I will give a simple proof of a similar statement in a more general setting, which includes knot Floer homology, Khovanov–Rozansky homologies, and all conic strong Khovanov–Floer theories. I will also discuss what happens in the case of strongly homotopy ribbon concordances instead of ribbon concordances.

Hiroaki Karuo *RIMS, Kyoto University*
Title: On the reduced Dijkgraaf–Witten invariant of knots in the Bloch group of $\mathbb{F}_p$
Abstract: In 2004, Neumann described the hyperbolic volume and the Chern–Simons invariant of a cusped 3-manifold in terms of the image of the Dijkgraaf–Witten invariant by a certain map. Whereas his work was in $\mathbb{C}$, we describe invariants of the complement of a knot by replacing $\mathbb{C}$ with a finite field.

Takuya Katayama *Hiroshima University*
Title: Embeddability between the right-angled Artin groups of surfaces
Abstract: After Kim–Koberda gave a combinatorial description of embeddings between right-angled Artin groups, embeddability of right-angled Artin groups has been studied by many researchers. However, very little is known about relation between the topology of flag complexes and embeddings of right-angled Artin groups. In this talk, we show the following: for any finite simple graph Λ whose flag complex is homeomorphic to a 2-sphere, and for any finite simple graph Γ whose flag complex is homeomorphic to a surface other than a 2-sphere, $A(\Lambda)$ cannot be embedded in $A(\Gamma)$.

Min Hoon Kim *POSTECH*
Title: Non-slice linear combinations of algebraic knots
Abstract: In 1976, Rudolph asked whether algebraic knots are linearly independent in the knot concordance group. In this talk, we discuss how to use twisted Blanchfield pairings to answer this question in the affirmative for new large families of algebraic knots. This is joint work with Anthony Conway and Wojciech Politarczyk.

Eiko Kin *Osaka University*
Title: Problem on pseudo-Anosov minimal entropies
Abstract: The aim of this talk is to survey the recent development on the subject. I will convey why the problem is interesting. I will also explain the significant role of fibered faces of hyperbolic fibered 3-manifolds for the study of the problem.

Yuka Kotorii *RIKEN*
Title: Levine's classification of 4-component links up to link-homotopy and its classification by claspers
Abstract: Two links are link-homotopic if they are transformed into each other by a sequence of self-crossing changes and ambient isotopies. The link-homotopy classes of 4-component links were classified by Levine with enormous algebraic computations. In this talk, we modify the results by using Habiro's clasper theory. The new classification gives more symmetrical and schematic points of view to the link-homotopy classes of 4-component links. We also gives some new subsets of the link-homotopy classes of 4-component links which are classified by invariants. This is joint work with Atsuhiko Mizusawa (Waseda University).

Jung Hoon Lee *Jeonbuk National University*
Title: On Casson–Gordon's rectangle condition for 3-bridge decompositions of knots
Abstract: For a Heegaard splitting of a 3-manifold, Casson–Gordon's rectangle condition is a condition on its Heegaard diagram that guarantees the strong irreducibility of the splitting; it requires 9 types of rectangles for every combination of two pairs of pants from opposite sides. The rectangle condition is also applied to bridge decompositions of knots. We give examples of 3-bridge decompositions of knots admitting a diagram with 8 types of rectangles, which are not strongly irreducible, i.e., it says that Casson–Gordon's rectangle condition is sharp. This is a joint work with Bo-hyun Kwon.

Shosaku Matsuzaki *Takushoku University*
Title: Oriented surfaces in the 3-sphere and their coloring invariants
Abstract: An oriented surface embedded in the 3-sphere S^3, called a spatial surface, is presented by a diagram of a trivalent graph in S^3. Spatial surfaces are characterized by some local replacements of their diagrams. I will talk on coloring invariants of spatial surfaces derived from the diagrammatic characterization. This study is joint work with Atsushi Ishii and Tomo Murao.

Delphine Moussard *Aix-Marseille University*
Title: Three-dimensional characterization of the slice genus of knots and links
Abstract: A slice knot is a knot in the 3-sphere that bounds a disk smoothly embedded in the 4-ball. More generally, the slice genus of a knot is the minimal genus of a surface smoothly embedded in the 4-ball and bounded by the knot. We will prove that the slice genus of a knot can be characterized as the minimal genus of a surface immersed in the 3-sphere except at a finite number of branched points, with no clasp intersection and no triple point of a certain type, and bounded by the knot. This generalizes a characterization of slice knots by Kawauchi, Shibuya and Suzuki. Moreover, we will extend this characterization to the slice genus of a colored link.

Tomo Murao *University of Tsukuba*
Title: Disk systems for handlebody-knots and their isotopy classes
Abstract: A handlebody-knot is a handlebody embedded in the 3-sphere, which can be regarded as a generalization of a classical knot with respect to a genus. A disk system of a handlebody-knot is a set of properly embedded non-parallel mutually disjoint essential disks in the handlebody-knot. In this talk, we discuss the isotopy classes of pairs of a handlebody-knot and its disk system through discussion on quandle connected components of multiple conjugation quandles.

Takefumi Nosaka *Tokyo Institute of Technology*
Title: K_1-valued Alexander polynomials of knots
Abstract: The K-groups have provided uniform understanding to several mathematical phenomena. The (twisted) Alexander polynomial is a landmark topic. As its generalization, we introduce a K_1-class from a group homomorphism from any knot group to any group. Moreover, we give some approaches to the K_1-class in terms of Reidemeister torsion, Fox derivatives, S^1-valued Morse theory. As a corollary, we defined a metabelian Alexander polynomial, and some estimate of fiberedness and sliceness.

Seungsang Oh *Korea University*
Title: Quantum knot mosaics and bounds of the growth constant
Abstract: The discovery of the Jones polynomial made an important connection between quantum physics and knot theory. Kauffman and Lomonaco introduced the knot mosaic system to define the quantum knot system for the purpose of representing an actual physical quantum system. This talk is inspired by an open question about the knot mosaic enumeration suggested by them. A knot $m \times n$-mosaic is an $m \times n$ array of eleven mosaic tiles representing a knot diagram by adjoining properly. The total number $D_{m\times n}$ of knot $m \times n$-mosaics, which indicates the dimension of the Hilbert space of the quantum knot system, is known to grow in a quadratic exponential rate. Recently, Oh *et al.* developed the state matrix recursion method producing the exact enumeration of knot mosaics, which uses a recursion formula of state matrices. Furthermore, they showed the existence of the knot mosaic constant $\delta = \lim_{m,n\to\infty} (D_{m\times n})^{\frac{1}{mn}}$ and found its upper and lower bounds in a series of papers. The latest upper bound was obtained through two new concepts: quasimosaics and cling mosaics. As a sequel to this research program, we adjust the state matrix recursion method to handle cling mosaics inside a quasimosaic, which is called the progressive state matrix recursion method. This method provides recursive matrix-relations producing a sharper bound of the knot mosaic constant:

$$4 \leq \delta \leq 4.1035507\cdots .$$

Kyungbae Park *Seoul National University*
Title: On definite fillings of lens spaces
Abstract: The intersection form of a compact, oriented 4-manifold is the intersection pairing on the second homology group of the manifold. Algebraically, it is a symmetric bilinear form on a finitely generated free abelian group. In this talk, we discuss which definite forms can be realized as the intersection form of a 4-manifold bounded by a given lens space. In particular, we completely classify such forms for some families of lens spaces. We also present some applications of our classifications. This is joint work with Dong Heon Choe.

Marco De Renzi *Waseda University*
Title: $2+1$-TQFTs from non-semisimple modular categories
Abstract: In recent years, the standard approach of Witten, Reshetikhin, and Turaev to quantum topology has been substantially generalized thanks to non-semisimple constructions which have produced powerful 3-manifold invariants and representations of mapping class groups of surfaces. We will explain how to use the theory of modified traces in order to renormalize Lyubashenko's invariants coming from non-semisimple modular categories. The resulting 3-manifold invariants extend to 2+1-TQFTs, unlike Lyubashenko's original ones. Based on a joint work with Azat Gainutdinov, Nathan Geer, Bertrand Patureau, and Ingo Runkel.

Shin Satoh *Kobe University*
Title: The 2-knots of triple point number four
Abstract: The triple point number of a 2-knot is the minimal number of triple points for all possible diagrams of the 2-knot. It is known that a 2-knot has the triple point number zero if and only if it is a ribbon 2-knot, and that there is no 2-knot of triple point number one, two, and three. The aim of this talk is to prove that a 2-knot has the triple point number four if and only if it is ribbon concordant to the 2-twist-spun trefoil knot.

Donggyun Seo *Seoul National University*
Title: Dehn twists, right-angled Artin subgroups and trees
Abstract: For an orientable finite type surface, Koberda showed sufficiently large powers of Dehn twists and purely pseudo-Anosov mapping classes (on subsurfaces) generate a right-angled Artin group. In this talk, we will focus on Dehn twists only and will show that the geometric intersection numbers of the underlying simple closed curves give a lower bound for exponents of powers to generate a right-angled Artin group. In the proof, we use tree actions of surface groups.

Kazuto Takao *Kyoto University*
Title: Local theory of the graphic of two trisections of a 4-manifold
Abstract: The so-called graphic of two Heegaard splittings of a 3-manifold M is very useful for comparing the splittings. It is the discriminant set of the product map $(f, g) : M \to \mathbb{R}^2$ of two smooth functions $f, g \colon M \to \mathbb{R}$ representing the Heegaard splittings. By analogy, for comparing two trisections of a 4-manifold X, the discriminant set of the product map $(\varphi, \psi) : X \to \mathbb{R}^4$ of two sable maps $\varphi, \psi \colon X \to \mathbb{R}^2$ is hopefully useful. In this talk, I give some local theory on reading off information from the discriminant set, and mention future application of it to global theory.

Hideo Takioka *Kyoto University*
Title: Vassiliev knot invariants derived from cable Γ-polynomials
Abstract: For coprime integers $p\ (> 0)$ and q, the (p, q)-cable Γ-polynomial of a knot K is the Γ-polynomial of the (p, q)-cable knot of K, where the Γ-polynomial is the common zeroth coefficient polynomial of the HOMFLYPT and Kauffman polynomials. In this talk, we give some results on Vassiliev knot invariants derived from cable Γ-polynomials.

Robert Tang *OIST*

Title: Coarse and fine geometry of the saddle connection graph

Abstract: For a translation surface, the associated saddle connection graph has saddle connections as vertices, and edges connecting pairs of non-crossing saddle connections. This can be viewed as an induced subgraph of the arc graph of the surface.

In this talk, I will discuss both the fine and coarse geometry of the saddle connection graph. We prove that the isometry type is rigid: any isomorphism between two such graphs is induced by an affine diffeomorphism between the underlying translation surfaces. However, the situation is completely different when one considers the quasi-isometry type: all saddle connection graphs form a single quasi-isometry class.

Both parts are based on joint work with Valentina Disarlo, Huiping Pan, and Anja Randecker.

Ryoto Tange *Tokyo Denki University*

Title: Non-acyclic SL_2-representations of twist knot groups and (-3)-Dehn surgeries

Abstract: We study irreducible $SL_2(\mathbb{C})$-representations ρ of twist knot groups such that the characters $\mathrm{tr}(\rho)$ lie on a certain line denoted as $x = y$. We prove that every hyperbolic twist knot admits a non-acyclic representation on $x = y$ and that every ρ on $x = y$ factors through the (-3)-Dehn surgery. This is joint work with Anh T. Tran and Jun Ueki.

Yuta Taniguchi *Osaka City University*

Title: Quandle coloring quivers for links and quivers of quandles

Abstract: In 2018, K. Cho and S. Nelson introduced the quandle coloring quiver which is an invariant for oriented links. Given a quandle X, a set of quandle endomorphisms $S \subset \mathrm{End}(X)$ and a link diagram D, the quandle coloring quiver $Q_X^S(D)$ is the directed graph with a vertex for every element in the set of X-colorings of D and an edge from f to g when $g = \varphi \circ f$ for an element $\varphi \in S$. In this talk, we will introduce a quiver called the quandle quiver or the quiver of a quandle X, which is a directed graph determined for the pair (X, S) and observe a relation between the quandle coloring quiver of a link and the quandle quiver.

Jun Ueki *Tokyo Denki University*

Title: Profinite rigidity for twisted Alexander invariants

Abstract: I will discuss the profinite rigidity of twisted Alexander invariants and hyperbolic volumes from a viewpoint of arithmetic topology.

Anderson Vera *RIMS, Kyoto University*

Title: Johnson-type homomorphisms and the Le–Murakami–Ohtsuki invariant

Abstract: One of the main objects associated to a surface Σ is its mapping class group $\mathcal{M}(\Sigma)$. By considering the action of $\mathcal{M}(\Sigma)$ on the fundamental group of Σ, it is possible to define different filtrations of $\mathcal{M}(\Sigma)$together with some homomorphisms on each term of the filtration, to which we refer as "Johnson-type homomorphisms". In this talk we present our results concerning two filtrations of $\mathcal{M}(\Sigma)$, whose definitions involve a handlebody bounded by Σ. We show the relationship between the corresponding Johnson-type homomorphisms and the functorial extension of the Le–Murakami–Ohtsuki (LMO) invariant of 3-manifolds.

Hyungkee Yoo *Korea University*

Title: Small lattice spatial 3-regular graphs with two vertices

Abstract: A lattice spatial graph is an embedding of a graph into the cubic lattice $\mathbb{Z}^3$. The lattice stick number $s_L(G)$ of a spatial graph G is defined to be the minimal number of straight line segments required to construct a lattice spatial graph. In this talk, we focus on specific graphs, which are the theta-curve and the handcuff graph. We rigorously prove that there are exactly six types of spatial graphs with up to 14 lattice sticks corresponding to a theta-curve and a handcuff graph. Their exact lattice stick numbers are presented.

Seokbeom Yoon *KIAS*

Title: Adjoint Reidemeister torsions from wrapped M5-branes

Abstract: In this talk, I would like to talk about a certain vanishing property of adjoint Reidemeister torsions for a hyperbolic 3-manifold which is derived from the physics of wrapped M5-branes on the manifold. We present a rigorous proof for the figure-eight knot complement and several numerical experiments. This is joint work with Dongmin Gang and Seonhwa Kim.

Ken'ichi Yoshida *Saitama University*

Title: Degeneration of 3-dimensional hyperbolic cone structures with decreasing cone angles

Abstract: The global rigidity of a 3-dimensional hyperbolic cone manifold is known in the case that the cone angles are at most π. The proof of the global rigidity by Kojima is based on the fact that hyperbolic cone structures do not degenerate in deformation with decreasing cone angles at most π. In this talk, I will give an example of degeneration of hyperbolic cone structures with decreasing cone angles less than 2π. These cone structures are constructed on a certain alternating link in $T^2 \times I$. The construction is reduced to describing dihedral angles for a certain hyperbolic polyhedron.

Wataru Yuasa *RIMS, Kyoto University*

Title: The $\mathfrak{sl}_3$ colored Jones polynomial of a $(2, m)$-torus link and its tail

Abstract: The $\mathfrak{sl}_3$ colored Jones polynomial ($\mathfrak{sl}_3$ CJP) is one of the quantum invariants of knots and links. I will talk about explicit formulas of $\mathfrak{sl}_3$ CJP and its limit called the $\mathfrak{sl}_3$ tail for a special coloring. In the case of CJP for $\mathfrak{sl}_2$, the tail of a $(2, m)$-torus link $T(2, m)$ is described as the Ramanujan's theta function. I will comment on the relationship between the $\mathfrak{sl}_3$ tail of $T(2, 2m)$ and a $\mathfrak{sl}_3$ theta function.

List of Participants

Tetsuya Abe (Ritsumeikan University)

Hirotaka Akiyoshi (Osaka City University)

Nobutaka Asano (Tohoku University)

Airi Aso (Tokyo Metropolitan University)

Shinpei Baba (Osaka University)

Benjamin Bode (Osaka University)

Jae Choon Cha (POSTECH)

Qingtao Chen
(New York University Abu Dhabi)

Sangbum Cho (Hanyang University)

Xinghua Gao (KIAS)

Hiroshi Goda (Tokyo University of Agriculture and Technology)

Kazuo Habiro (RIMS, Kyoto University)

María de los Angeles Guevara Hernández
(Osaka City University)

Kazuhiro Ichihara (Nihon University)

Daiki Iguchi (Hiroshima University)

Ayumu Inoue (Tsuda University)

Katsumi Ishikawa (RIMS, Kyoto University)

Tetsuya Ito (RIMS, Kyoto University)

BoGwang Jeon (POSTECH)

Gyo Taek Jin (KAIST)

Naoko Kamada (Nagoya City University)

Seiichi Kamada (Osaka University)

Taizo Kanenobu (Osaka City University)

Sungkyung Kang
(Chinese University of Hong Kong)

Hiroaki Karuo (RIMS, Kyoto University)

Takuya Katayama (Hiroshima University)

Inkang Kim (KIAS)

Min Hoon Kim (POSTECH)

Se-Goo Kim (Kyung Hee University)

Taehee Kim (Konkuk University)

Naoki Kimura (Waseda University)

Eiko Kin (Osaka University)

Toshitake Kohno (The University of Tokyo)

Yuka Kotorii (RIKEN)

Jung Hoon Lee (Jeonbuk National University)

Chaeeun Lim (KAIST)

Yukio Matsumoto (Gakushuin University)

Shosaku Matsuzaki (Takushoku University)

Delphine Moussard (Aix-Marseille University)

Tomo Murao (University of Tsukuba)

Inasa Nakamura (Kanazawa University)

Yasutaka Nakanishi (Kobe University)

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(Tokyo Institute of Technology)

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Kyungbae Park (Seoul National University)

Marco De Renzi (Waseda University)

Takuya Sakasai (The University of Tokyo)

Shin Satoh (Kobe University)

Donggyun Seo (Seoul National University)

Tatsuro Shimizu (RIMS, Kyoto University)

Reiko Shinjo (Kokushikan University)

Masaaki Suzuki (Meiji University)

Yuuki Tadokoro (National Institute of Technology, Kisarazu College)

Akihiro Takano (University of Tokyo)

Kazuto Takao (Kyoto University)

Toshie Takata (Kyushu University)

Hideo Takioka (Kyoto University)

Baseda Tamotsu (Osaka City University)

Kokoro Tanaka (Tokyo Gakugei University)

Robert Tang (OIST)

Ryoto Tange (Tokyo Denki University)

Yuta Taniguchi (Osaka City University)

Jun Ueki (Tokyo Denki University)

Anderson Vera (RIMS, Kyoto University)

Hyungkee Yoo (Korea University)

Seokbeom Yoon (KIAS)

Ken'ichi Yoshida (Saitama University)

Wataru Yuasa (RIMS, Kyoto University)

5. Campus Map


North Campus
北部構内
North Campus
田中樋ノ口町
Tanaka Hinokuchicho
御蔭通 Mikage St.
北白川小倉町
Kitashirakawa Oguracho
グラウンド北門
北門
東門
西門
CO-OP Cafeteria
(closed on Feb. 11th)
Research Institute for
Mathematical Sciences
食堂 Cafeteria
生協店舗
Cooperative Store
バス停 Bus Stop
自動体外式除細動器(AED)
Automated External Defibrillator
北白川
Kitashirakawa
今出川通 Imadegawa St.
銀閣寺
Ginkakuji
京阪出町柳駅
Keihan Demachiyanagi Station
百万遍
Hyakumanben
百万遍
Hyakumanben
百万遍門
西部構内
West Campus
Main Campus
本部構内
Main Campus
京大農学部前
Kyodai Nogakubu-mae
Clock Tower
Café-Restaurant "Camphora"
東一条通 Higashi-Ichijo St.
京大正門前
Kyodai Seimon-mae
吉田神社
Yoshida Shrine
吉田南構内
Yoshida-South Campus
京都大学前
Kyoto University
東大路通 Higashioji St.
インフォメーションセンター
Information Center
食堂 Cafeteria
生協店舗
Cooperative Store
京大ショップ Co-op Gift Shop
ミュージアムショップ Museum Shop
カフェ Cafe
バス停 Bus Stop
バス停(hoop) Bus Stop (hoop)
自動体外式除細動器(AED)
Automated External Defibrillator
※マップ内のAED表示マークは、その場・最寄
AEDが備え付けられている事をおすすめので、
正確な設置場所ではありません。
近衛通
Konoedori
近衛通 Konoe St.