Abstract

On crossing changes and band-surgeries

TETSUYA ABE
Osaka City University

A band-move is a local move of a link diagram which is performed by adding a band. We define the band-unknotting number of a knot K to be the minimum number of band-moves needed to transform a diagram of K into that of the trivial knot. We show that the band-unknotting number of a knot K is less than or equal to half the crossing number of K and the equality holds if and only if K is the trivial knot or the figure-eight knot. We also study the band-unknotting number from the view point of a surface embedded into a 4 dimensional space.

A family of braids with large conjugacy invariant sets

Byung Hee An
KAIST

The best known algorithm for conjugacy problem is to generate the reduced super summit set after taking a suitable power of given braid to make it rigid. We give a family of rigid braids independently parameterized by braid index and (canonical) length whose reduced super summit sets grow exponentially in braid index and linear in length and conclude that the conjugacy problem remains exponential in braid index under the current knowledge.

On the Bollobás-Riordan polynomials

Yongju Bae
Kyungpook National University

The Bollobas-Riordan polynomial of ribbon graphs, which is a generalization of the Tutte polynomial,is closely elated with the Kauffman bracket polynomial of virtual links. Let G and H be two ribbon graphs with two fixed edges $e = uv$ and $e' = u'v'$, respectively. By removing edges e and e' and attaching u with u' and v with v', we get a new ribbon graph $(G, e)\#(H, e')$. In this talk, I will calculate the Bollobas-Riordan polynomial $R_{(G,e)\#(H,e')}$ of $(G, e)\#(H, e')$ from the information of $R_{(G,e)}$ and $R_{(H,e')}$.

Homology and L2-signatures from amenable groups

Jae Choon Cha
POSTECH

L2-signatures have been playing a central role in the study of concordance of knots and links and homology cobordism of 3-manifolds, since the ground-breaking work of Cochran, Orr, and Teichner. We introduce a new L2-theoretic approach for a class of amenable groups, which extends key results concerning invariance of L2 signatures and L2-betti numbers. Our method subsumes past

results which depends on poly-torsion-free-abelian groups. Many of our applications involve groups with torsion, unassailable via prior tools. In particular we prove that there are non-slice knots which have vanishing Cochran-Orr-Teichner signature obstructions. (Partly joint with Kent Orr.)

An invariant for knots

Zhiyun Cheng
Beijing Normal University

It is known that any knot K in S3 can bounds immersed 2-disks. A knot invariant I(K) is derived from the self intersection arcs of these immersions. Some properties of the invariant are discussed and a relationship with knot genus is given.

The complex volumes of twist knots

Jinseok Cho
Waseda University

For a given hyperbolic knot, Yokota defined a potential function whose imaginary part gives the hyperbolic volume of the knot complement. We will show that, for a twist knot, the function actually gives the complex volume of the knot complement using Zickert's and Neumann's theory of the extended Bloch groups and the complex volumes. This is a joint work with Jun Murakami of Waseda University and Yoshiyuki Yokota of Tokyo Metropolitan University.)

Heptagonal figure-8 knots

Youngsik Huh
Hanyang University

In this talk we give a necessary and sufficient condition for a heptagonal knot to be figure-8. The condition is described by a set of Radon partitions which is formed by the vertices of the polygon. In addition we relate this result to the number of heptagonal knots residing in linear embedding of the complete graph K_7 in R^3.

An estimation of Heegaard distance by using Reeb graph

Ayako Ido
Nara Women's University

Let P, Q be Heegaard surfaces of an irreducible 3-manifold. In [*], J.Johnson introduced a method for giving an estimation of the (Hempel) distance of P via genus of Q by using horizontal arc in the Rubinstein-Scharlemann graphic derived from P and Q. In this talk, we give a more detailed treatment for the horizontal arc (that is the Reeb graph derived from horizontal arc), which gives a sharp estimation of the distance. *J. Johnson, Flipping and stabilizing Heegaard splittings, preprint (2008)

A complex volume formula via quandle shadow coloring (joint work with Yuichi Kabaya)

Ayumu Inoue
Tokyo Institute of Technology

For a hyperbolic manifold M, vol(M) + i CS(M) is called the complex volume of M. Here, vol(M) denotes the volume of M and CS(M) the Chern-Simons invariant of M. Neumann defined the extended Bloch group, and gave a formula of the complex volume using it. In this talk, we introduce a construction of an element of extended Bloch group from a quandle shadow coloring. Combining works of Neumann and Dupont-Zickert, we obtain a formula of complex volume. This is a joint work with Yuichi Kabaya (OCAMI, Osaka City University).

Normalizations for the Yamada polynomial

Atsushi Ishii
University of Tsukuba

The Yamada polynomial is a regular isotopy invariant for spatial graphs. It is an ambient isotopy invariant for spatial trivalent graphs up to a multiplication by a power of $-A$. I introduce a normalization for the Yamada polynomial of a spatial embedding of a trivalent (3-regular) graph which possesses a cycle double cover. This normalization is a generalization of the twisting number. I expain the benefit to utilize our normalization from the view point of Vassiliev type invariants, skein relations, and their evaluations.

Bi-invariant orderings of groups and finite type invariants

Tetsuya Ito
The University of Tokyo

Using Chen's iterated integrals, we give a new method to construct bi-invariant orderings of residually torsion-free nilpotent groups. This construction provides a uniform way to understand known examples of bi-orderings, such as pure braid groups, free groups and fundamental groups of oriented surfaces. We show that this ordering is detected by finite type invariants in pure braid group case

Invariants of conjugacy classes of surface braids derived from Fox n-colorings

Masahide Iwakiri
Osaka City University

In this talk, we introduce invariants of conjugacy classes of surface braids derived from Fox n-colorings. As applications, we give an infinite sequence of mutually non-conjugate surface braids with the same degree whose closures are equivalent as surface-links, and also give necessary conditions to have non-trivial colorings of surface-links represented by charts.

Symmetric quandle colorings for handlebody-links

Yeonhee Jang
Hiroshima university

A handlebody-link is a disjoint union of circles and a finite trivalent graph embedded in the 3-sphere considered up to isotopies and IH-moves. A. Ishii and M. Iwakiri defined an invariant for (flowed) handlebody-links using quandles. We refine the invariant using "symmetric" quandles. (This is joint work with Kanako Oshiro.)

A remark on fixed points of surface maps

Boju Jiang
Peking University

Last year in Gyeongju we reported on some bounds for graph maps. Now we extend them to surface maps. Unexpectedly, a key ingredient in the graph case needs a fresh treatment for surfaces.

Gromov hyperbolicity of a variation of the Gordian complex

In Dae Jong
Osaka City University

We will introduce simplicial complexes by using various invariants and local moves on knots, which give generalizations of the Gordian complex defined by Hirasawa and Uchida. In this talk, we will consider the simplicial complex defined by using the Alexander-Conway polynomial and the Delta-move, and show that the simplicial complex is Gromov hyperbolic. This is a joint work with Kazuhiro Ichihara.

Lens space surgeries along certain 2-component links and Reidemeister-Turaev torsion

Teruhisa Kadokami
Dalian University Of Technology

We determine when the results of $(r, 0)$-surgery along certain 2-component links, denoted by $A_{m,n}$ and $B_{p,q}$, become lens spaces. The links are discussed well on a theory of generalized rational blow down in 4-dimensional topology. Our first main theorem is that for the $A_{m,n}$ case, only the known surgery ($r = mn$) except one special case ($(m, n) = (2, 3)$ and $r = 7$) yields a lens space. The second main theorem is that for the $B_{p,q}$ case, there is an infinite sequence for r yielding a lens space. By combining with a second author's result, if the result of $(r, 0)$-surgery along $A_{m,n}$ is a lens space, then there is the bounding rational 4-ball associated to the Kirby diagram, and it is related with that of the result of $(r', 0)$-surgery along $B_{p,q}$ except the special case by generalized rational blow down. Our main tool for the proof is the Reidemeister-Turaev torsions (i.e.

Reidemeister torsions with combinatorial Euler structures). We also point out that $A_{m,n}$ is closely related with Berge knot of type VII and VIII. This is a joint work with Yuichi Yamada.

Quandle of twisted links

Naoko Kamada
Nagoya City University

Twisted links are defined by M. O. Bourgoin, which are related to link diagrams on closed, possibly non-oriented surface. A quandle is a kind of self-distributive algebraic structure. Quandles associated with links are invarinats of links. We define quandles of twisted links.

On symmetric quandle presentations and surface-knots

Seiichi Kamada
Hiroshima University

A symmetric quandle is a quandle with a good involution. I will explain the definition of a presentation of a symmetric quandle, and how to get a presentation for the symmetric quandle of a surface-knot in 4-space.

H(2)-Gordian Distance of Knots

Taizo Kanenobu
Osaka City University

An $H(2)$-move is a local move of a knot which is performed by adding a half-twisted band. It is known an $H(2)$-move is an unknotting operation. We define the $H(2)$-*Gordian distance* of two knots to be the minimum number of $H(2)$-moves needed to transform one into the other. We give several methods to estimate the $H(2)$-Gordian distance of knots. Then we give tables of $H(2)$-Gordian distances of knots with up to 7 crossings.

Applying spatial graph imitations

Akio Kawauchi
Osaka City University

Twenty years ago, the speaker proposed an idea of "AID(=almost identical) imitations" which transforms a given spatial graph (S^3, Γ) (without degree one vertices) into hyperbolic spatial graphs (S^3, Γ^*)distinct from the original one but with an imitation map, that is, a map $q : (S^3, \Gamma^*) \to (S^3, \Gamma)$ admitting several properties "close" to a homeomorphism. In this talk, some applications of this spatial graph imitation to knot theory are explained.

A partial order on the set of prime knots

Teruaki Kianto
Soka University

A partial order can be defined on the set of prime knots by using epimorphisms between knot groups. For the set of knots with up to 11 crossing, it could be completely decided in the works of Kitano-Suzuki and Horie-Kitano-Matsumoto-Suzuki. By observing this result precisely, we can see some geometric phenomena. In this talk, we discuss the minimality and geometric meanings of epimorphism, in particular, relations to non-zero degree maps. This is joint work with Masaaki Suzuki.

$\mathfrak{sl}(1|1)$ Combinatorial webs and its weight systems

Dongseok Kim
Kyonggi University

Temperley-Lieb algebras had been generalized to web spaces for rank 2 simple Lie algebras which led us to link invariants for these Lie algebras as a generalization of Jones polynomial. Recently, Geer found a new generalization of Jones polynomial for some Lie superalgebras. In this talk we study the quantum $\mathfrak{sl}(1|1)$ representation theory using the web space and find a finite presentation of the representation category (for generic q) of the quantum $\mathfrak{sl}(1|1)$. At last we discuss the quantum $\mathfrak{sl}(1|1)$ weight systems.

Symplectic circle actions and isolated fixed points of symplectic manifolds

Jin Hong Kim
KAIST

Every Hamiltonian circle action on a compact symplectic manifold must have fixed points, due to the existence of the maximum and minimum points of the moment map. So it is natural to ask when a symplectic circle action on a compact symplectic manifold becomes Hamiltonian in terms of the fixed point data. For this question, there is a well-known conjecture saying that if the fixed point set of a symplectic circle action on a symplectic manifold is non-empty and isolated, then the symplectic circle action becomes Hamiltonian. In this talk we present some recent progress toward this conjecture.

The cobordism on homology cylinders and torsions

Taehee Kim
Konkuk University

Garoufalidis and Levine introduced the homology cobordism group of homology cylinders over a surface, which can be regarded as an enlargement of the mapping class group. Using torsions invariants, we show that the abelianization of the group is infinitely generated if the first Betti number of the surface is positive and has infinite rank if the surface has more than one boundary component. We also show similar results for the homology cylinder analogue of the Torelli group. This is joint work with Jae Choon Cha and Stefan Friedl.

A table of pseudo-prime genus two handlebody-knots with up to six crossings

Kengo Kishimoto
Osaka City University

This is a joint work with Atsushi Ishii, Hiromasa Moriuchi and Masaaki Suzuki. A genus two handlebody-knot is a genus two handlebody embedded in the 3-sphere. A handlebody-knot can be represented by a spatial trivalent graph as its regular neighborhood. A handlebody-knot is pseudo-prime if every spatial trivalent graph which represents the handlebody-knot does not have a composite minimal diagram. Our aim is to enumerate all pseudo-prime genus two handlebody-knots with up to six crossings.

On metabelian Reidemeister torsion

Takahiro Kitayama
Graduate School of Mathematical Sciences, The University of Tokyo

The highest degree coefficients of higher-order Alexander polynomials of order 1 are investigated in terms of Reidemeister torsion. Reducing the group where the coefficients belong, we introduce an invariant associated to an element of the first cohomology group in a certain abelian group determined by the Alexander polynomial. We also give a necessary condition on the invariant for a 3-manifold to be fibered over a circle and examples of knots where the Alexander modules are same but our invariants are different.

How to tell reducible braids among rigid braids.

Ki Hyoung Ko
KAIST

Since every pseudo-Anosov braid can be made rigid up to taking a power and an iteration of cycling, it is important to decide whether a given rigid braid is reducible in order to solve the reducibility problem. We propose an algorithm for this decision problem that is polynomial-time in both the braid index and the length of an input.

Graphs whose 3,4-graph braid groups are right-angled Artin groups

Joon Hyun La
KAIST

For braid indices 3 and 4, we classify graphs containing no nucleus, that is a minimal graph whose braid group is not a right-angled Artin group. We show that the braid groups for such graphs are right-angled Artin groups.

Prime knots with the arc index smaller than the minimal crossing number

Hwa Jeong Lee
KAIST

For prime knots, it is known that the arc index of alternating knots is the minimal crossing number plus two and the arc index of non-alternating knots is less than or equal to the minimal crossing number. We study the cases when the arc index of non-alternating knots is less than the minimal crossing number.

Tunnel number one, locally unknotted theta curves are prime

Jung Hoon Lee
KIAS

We show that tunnel number one, locally unknotted theta curves are prime.

Satellite twisted torus knots

Sangyop Lee
Chung-Ang University

We investigate the case where a twisted torus knot is a satellite knot.

Additivity of Heegaard genera under annulus sum

Fengling Li
Haerbin institute of technology

Suppose A_2 is non-separating on F_2. Let M be the annulus sum of M_1 and M_2 along A_1 and A_2. In this talk, we show that if M_i has a high distance Heegaard splitting and $g(F_i) \geq 2$ for $i = 1, 2$, then the minimal Heegaard splitting of M is unique up to isotopy and $g(M) = g(M_1) + g(M_2)$. This is joint work with Fengchun Lei and Guoqiu Yang.

Nonsmoothable involutions on elliptic surfaces

Ximin Liu
South China Institute of Tech.

Let X be the relatively minimal elliptic surface with rational base. In this talk, we will prove that there exist some locally linear $\mathbb{Z}_2$-actions on elliptic surfaces which can not be smooth with respect to any smooth structure on X. (This is joint work with Changtao Xue.)

Hyperbolicity of genus two Hatcher-Thiurston complex

Jiming Ma
Fudan University

For a $n-$punctured genus g surface $F_{g,n}$, we prove that the Hatcher-Thurston complex $HT(F_{1,n})$ is hyperbolic in the sense of Gromov, and $HT(F_{2,n})$ is strongly relative hyperbolic. The motivation of this work is the application of the Hatcher-Thurston complex to the geometry and topology of Heegaard splittings of $3-$manifolds. This is a joint work With Li Youlin.

On roots of Dehn twists

Naoyuki Monden
Osaka University

Margalit and Schleimer constructed nontrivial roots of the Dehn twist about a nonseparating curve. We prove that the conjugacy classes of roots of the Dehn twist about a nonseparating curve correspond to the conjugacy classes of periodic maps with certain conditions.Futhermore, we give data set which determine the conjugacy class of a root.As a consequence, we can find the minimum degree and the maximum degree, and show that the degree must be odd.

Characterization of composite twisted torus knots

Kanji Morimoto
Konan University

Let $T(p, q; r, s)$ be a twisted torus knot, i.e., a torus knot of type (p, q) with s-times full twists on r-strands. In the present talk, we will characterize composite twisted torus knots. In fact, we will show the following : Theorem : $T(p, q; r, s)$ is a composite knot if and only if $p = (a + 1)k + 1$, $q = ak + 1$,$r = p - k_1$ and$s = -1$ for some $a > 0$, $k > 3$ and $k_1 > 1$ with $k_1 < k - 1$ In this case,$T((a + 1)k + 1,\ ak + 1\ ;\ (a + 1)k + 1 - k_1, -1)$ is a connected sum of $T(k_1, ak_1+1)$ and $T((a+1)k_2+1, -k_2)$, where $k_2 = k-k_1 > 1$. As an example, we will show that $T(11, 6; 8, -1)$ is a connected sum of $T(3, 4)$ and $T(5, -2)$.

An enumeration of non-prime theta-curves and handcuff graphs with up to seven crossings

Hiromasa Moriuchi
Osaka City University Advanced Mathematical Institute

We have enumerated all the prime theta-curves and handcuff graphs with up to seven crossings before. We can composite many spatial graphs by using "connected sum" of them. However, for spatial graphs, "connected sum" is not unique. In this talk, we enumerate non-prime theta-curves and handcuff graphs with up to seven crossings by using algebraic tangles and non-prime basic theta-polyhedra.

Symmetric surgery presentations for symmetric manifolds

Daniel Moskovich
Research Institute for Mathematical Sciences, Kyoto University

Any 3-manifold which admits a properly discontinuous faithful action of a cyclic group of order n by orientation-preserving diffeomorphisms has a surgery presentation which is symmetric with respect to the standard $\frac{2\pi}{n}$ rotation symmetry of $S3$ by results of Montesinos, Przytycki-Sokolov, and Sakuma. This is called a visualization theorem, because it allows us to visualize in $S3$ the rotation symmetry of the manifold. We consider extensions of this result to actions by other finite subgroups of $SO(3)$, and beyond.

A topological aspect of the Chebyshev polynomials

Fumikazu Nagasato
Meijo University

We will show an easy application of the Chebyshev polynomials in topology by discussing irreducibility of the defining polynomial of the $SL_2(\mathbb{C})$-character variety of twist knot groups over complex number field. The irreducibility was originally observed by Hoste and Shanahan using computer arguments, and afterward by Vu and Le.

Notes on virtual knots with trivial polynomial invariants

Takuji Nakamura
Osaka Electro-Communication University

As a generalization of classical knots, L. Kauffman introduced a notion of virtual knots. He defined the Jones type polynomial for virtual knots and showed that there exist infinitely many non trivial knots whose Jones type polynomial is trivial. In this talk, we show that there exists an infinite family of non trivial virtual knot whose multivariable Miyazawa polynomial is trivial. We note that multivariable Miyazawa polynomial is one of polynomial invariants which are generalizations of the Jones type polynomial for virtual knots.

Alexander polynomials of knots which are transformed into the trefoil knot by a single crossing change

Yasutaka Nakanishi
Kobe University

By the work of Kondo and Sakai, it is known that Alexander polynomials of knots which are transformed into the trivial knot by a single crossing change. In this talk, we will characterize Alexander polynomials of knots whichg are transformed into the trefoil knot by a single crossing change.

On quandle homology groups of Alexander quandles of prime order

Takefumi Nosaka
Kyoto University

Given a 2-,3-,or 4-quandle cocycle, it is known that we define a quandle cocycle invariant for 1-knots or 2-knots. Then it is important to search the quandle (co)homology and the cocycles. Our main theorem is to determine the integral quandle homology groups of Alexander quandles of prime order. This settles "the delayed Fibonacci conjecture" by M. Niebrzydowski and J. H. Przytycki. Further, we determine the cohomology group and obtain relatively simple presentations of all higher degree cocycles which generate the cohomology group. Furthermore, we prove that the integral quandle homology of a finite connected Alexander quandle is annihilated by the order of the quandle. In this talk, the speaker will present the higher degree cocycles and outline the proof of the main theorems.

The differences of Alexander polynomials caused by a single crossing change

Yuki Okada
Kobe University

In this talk, we will characterize the Alexander polynomials of knots obtained from a knot with a monic Alexander polynomial by a single crossing change. The proof is given by a surgical description of Alexander matrices. As a corollary, it holds that $d_{\mathrm{G}}(10_{132}, 3_1) = 2$, $d_{\mathrm{G}}(10_{132}, 6_2) = 2$ and so on.

On the bridge genus and the braid genus for a lens space

Shinya Okazaki
Osaka City University

We consider a 3-manifold obtained by the 0-surgery of the 3-sphere along a link. The bridge genus (resp. the braid genus) of a 3-manifold is the minimal number of the bridge index (resp. the braid index) for any link such that the 3-manifold is obtained by the 0-surgery of the 3-sphere along the link. In this talk, we calculate the bridge genus and the braid genus for some lens space.

Extensions of odd order dihedral quandles and an application for surface-links

Kanako Oshiro
Hiroshima University

In this talk, we construct extensions of odd order dihedral quandles which satisfy some properties. For the extension of the dihedral quandle of order 3, some symmetric quandle homology groups are computed. They are applied for studies of surface-links. This is the joint work with J. S. Carter (The university of South Alabama) and M. Saito (The university of South Florida).

Khovanov homology and its torsion

Hanchul Park
KAIST

Eun Soo Lee has studied the so-called knight pairing of Khovanov homology, and Shumakovitch applied it to the $\mathbb{Z}$-version of the homology. In this talk we strengthen Shumakovitch's result, so that the Khovanov homology has torsion of order 2 only in many case of H-thin links such as quasi-alternating links.

Torsions in homologies of graph braid groups

HyoWon Park
KAIST

We show that a given garph is planar if and only if the first homology of its braid group is torsion free. We also discuss the nature of torsions in homologies of braid groups for non-planar graphs.

The Cannon-Thurston map, fractal tessellations and degeneration of circle chains (joint work with Caroline Series)

Makoto Sakuma
Hiroshima University

Let $\{(r_n^-, r_n^+)\}$ be a sequence of mutually distinct rational numbers converging to a pair (λ^-, λ^+) of mutually distinct irrational numbers. Let G_n be the marked punctured torus group with end invariants (r_n^-, r_n^+), and let G be the marked punctured torus group with end invariants (λ^-, λ^+). The limit set $\Lambda(G_n)$ of G_n is a circle packing, where there associated with a series of round circles, C_n, in $\Lambda(G_n)$, called the circle chain (D. Wright, L. Keen and C. Series). On the other hand, the limit set $\Lambda(G)$ of G is the whole Riemann sphere, where there associated with a fractal tessellation, CW, of the complex plane (J. Cannon, W. Thurston, and W.Dicks). In this talk, we show that the circle chains $\{C_n\}$ converges to the 1-skeleton of CW with respect to the Hausdorff topology.

Application of length of quandle 3-cocycle to surface-knot theory

Shin Satoh
Kobe University

The homology and cohomology theory of a quandle is useful to study knotted surfaces in 4-space. We define the length of a 3-cocycle of a quandle equipped with a quandle-set, and calculate the lengths of some 3-cocycles. We give lower bounds of the triple point number and sheet number of a surface-knot by the length of a quandle 3-cocycle. In particular, we see that the 2-twist-spun figure-eight knot has the triple point number eight.

The warping degree of a link diagram

Ayaka Shimizu
Osaka City University

The warping degree d(D) of an oriented unordered link diagram D is the smallest number of crossing changes which are needed to obtain a monotone diagram from D. We show that d(D)+d(-D)+sr(D) is less than or equal to the crossing number of D, where sr(D) denotes the number of a component with self-crossing in D. We also give a condition when the equality holds. Some relations of the warping degree to the linking number, unknotting number, and splitting number are studied.

Knot Floer homology and Alexander modules of symmetric unions

Toshifumi Tanaka
POSTECH

There exists a pair of knots which have the same Alexander module, but different Khovanov homology and different knot Floer homology. We give a pair of

symmetric unions of two-bridge knots with the same Khovanov homology and the same knot Floer homology, but different Alexander modules. We also give a pair of symmetric unions of two-bridge knots with the same Khovanov homology, the same knot Floer homology and the same HOMPLY polynomial, which are not mutants. This is a joint work with Jae Choon Cha.

2-ADJACENT KNOTS

Zhixiong Tao
Zhejiang University of Science and Technology

In this paper, we study several relations respectively to 2-adjacent knots with$a_2 = 0$ and $a_2 = \pm 1$ and prove some properties of these knots using their Conway polynomials and HOMFLY polynomials, decide all undecided knots given by N. Askitas and A. Stoimen

Diagrammatic invariants and Miyazawa polynomials for virtual knots

Yumi Tomiyama
Kobe University

We will show several properties of virtual knots by using the Miyazawa polynomial. In particular, we give a lower bound of the number of states consisting of a single loop. We also discuss the real crossing number in terms of the Miyazawa polynomial.

On combinatorial Floer homology

Jiajun Wang
California Institute of Technology

Heegaard Floer theory is a package of invariants for three-manifolds, four-manifolds, homologous knots and etc. It detects the fibredness of knots and three-manifolds and Thurston norms. In four dimension, Heegaard Floer homology can be used to distinguish exotic smooth structures. In this talk, we will discuss about a combinatorial theory which is equivalent to the Hat version of Heegaard Floer homology.

Graph manifolds have virtually positive Seifert volume

Shicheng Wang
Peking University

There are two invariants of 3-manifolds which respect maps: simplicial volume and Seifert volume. For prime 3-manifolds, simplicial volume detects exactly their hyperbolic parts and 3-manifolds with zero simplicial volume are exactly graph manifolds.
It is proved recently that each closed non-trivial graph manifold has a finite cover of positive Seifert volume. As a consequence for each closed orientable prime

3-manifold N, the set of mapping degrees D(M,N) is finite for any 3-manifold M unless N is finitely covered by either a torus bundle, or a trivial circle bundle, or the 3-sphere.
This is joint work with Pierre Derbez.

A generalization of the Kauffman 2 varibale poloynomial

Jifu Xiao
Dalian University of Technology

We construct a new knot polynomial, which is a generalization of the Kauffman 2 varibale poloynomial. We also discuss its properties.

On BC-equivalence between two tuples of the standard generators of an Artin group of finite type

Yoshiro Yaguchi
Department of Mathmatics Hiroshima University

Hurwitz action of the n-braid group B_n on the n-fold direct product G^n of a group G is studied. We show that any n-tuple of the n distinct standard generators of an Artin group of finite type is transformed into any of those by Hurwitz action together with the action of the Artin group by conjugation.

Every Berge's knot of lens space surgery is a divide knot

Yuichi YAMADA
University of Electro-communications

I complete my recent work as the title. Under A'Campo's divide knot theory, some knots are presented by the plane curves. Typical example: the torus knot $T(p,q)$ is presented by the Billiard curve in the rectangle $p\times q$. This presentation helps us to study the construction of the complicated knots. In this talk, the sporadic examples in the Berge's list are focused. New method is the strongly invertibility of divide knots.

Skein polynomial of a link with local symmetry

Seung Yeop Yang
Kyungpook National University

Let D be an universe of an oriented link diagram. By suitably replacing all singular points of D with an oriented 4-tangle T, we can get a new oriented link diagram $D(T)$, called a *link diagram with local symmetry*. For a function $s : C(D) \to \{\pm 1\}$, let D_s be the diagram of an oriented link obtained from D by changing each singular point c into a crossing with the sign $s(c)$. Following is the main result of the talk.
Theorem Suppose that $T = f(v,z)U_+ + g(v,z)U_-$ as an element of E_4. Then the skein polynomial of $D(T)$ is given by

$$P_{D(T)} = \sum_s f(v,z)^{a(s)} g(v,z)^{b(s)} P_{D_s}$$

where s runs through all functions $s : C(D) \to \{\pm 1\}$.
As an application of the result, we will try to obtain a lower bound for the braid index of the link with local symmetry.

A new knot polynomial

Zhiqing Yang
Dalian University Of Technology

We construct a new knot polynomial, which is a generalization of the HOMFLY poloynomial, and has at least 9 variables.

Lyapunov graphs of nonsingular Smale flows on $S^1 \times S^2$

Bin Yu
Tongji University

A fundamental question in dynamics is to classify some type of flows up to topological conjugation. In this topic, we will use Lyapunov graph to describe the disposition of the basic sets of nonsingular Smale flows (NSF) on $S^1 \times S^2$. It is can be looked as a rough classification of NSF on $S^1 \times S^2$. This work is a generalization of J.Franks' work about NSF on S^3.

Geometry and topology of the SL(2,C) character variety of the once-punctured torus group

Ying Zhang
Soochow University

Abstract: The SL(2,C) character variety of the once-punctured torus group (a free group on two generators) has very rich geometric and topological information. Based on work of B.H.Bowditch, in joint work with S.P.Tan and Y.L.Wong, we characterize the Bowditch subset of the SL(2,C) character variety and obtain for them generalized McShane identity as well as Bowditch-McShane identity, and further study the end invariant subsets for non-Bowditch characters. We also discuss some unsolved problems and indicate certain new potential research directions.

Non-singular Smale flows and torsions of 3-manifolds

Xuezhi Zhao
Capital Normal University

There is a long history question how dynamical systems are constrained by the topology of underlying phase space. The Poincaré-Hopf index theorem for the singular points of vector fields may be the first significant result in this direction. It is natural to ask for its generalization when the given invariant set is a little complicated than a singular point. A Smale flow is a structurally stale flow with one-dimensional invariant set. J. Franks found out the relation between the linking matrices of basic sets of a non-singular Smale flow in S^3

and the Alexander polynomial of link consisting of some closed orbits. We shall show that the Franks' relation still holds for all non-singular Smale flows on any oriented compact 3-manifold. The Alexander polynomial is replaced by its generalization — a kind of Whitehead torsion.

Categorification of representations of quantum groups

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Among recent developments in knot theory are the discoveries of Knot Floer Homology and Khovanov Homology, known as categorifications of Alexander polynomial and Jones polynomial, respectively. By categorifying representations of quantum groups one may generalize these knot homologies. In this talk I will show some aspects of this categorification from the point view of knot theory, emphasizing on the specific case of quantum sl_2.