The 7th KOOK-TAPU Joint Seminar on Knot Theory and Related Topics

Osaka City University
July 26– 30, 2015

Abstracts

July 26 Sunday

On the super additivity of tunnel numbers of knots

Ruifeng Qiu (East China Normal University)

For a knot K in a 3-sphere, we denote by $t(K)$ the tunnel number of K. Let K_1 and K_2 be two knots in a 3-sphere. The super additivity of tunnel numbers is the following question: If $t(K_1 \sharp K_2) = t(K_1) + t(K_2) + 1$? In this talk, I will introduce some results on the super additivity question after Morimoto's observation.

Fox-Hosokawa conjecture and knotted real projective planes

Yongju Bae (Kyungpook National University)

Fox-Hosokawa conjecture says that if L is a trivial link and $\mathfrak{B}$ is a complete fusion band set such that $L_{\mathfrak{B}}$ is a trivial knot, then the closed realizing surface of the hyperbolic transformation $L \xrightarrow{\mathfrak{B}} L_{\mathfrak{B}}$ is unknotted. In this talk, we will discuss Fox-Hosokawa conjecture and study the knottedness of the real projective plane as an application.

Canonical genus and Whitehead doubles of alternating knots

Takahiro Miura (Kobe University)

The canonical genus of a knot is defined as the minimal genus of all surfaces obtained by applying Seifert's algorithm to diagrams of the knot. Tripp and Nakamura posed the question whether the canonical genus of the Whitehead doubles of alternating knots is equal to the crossing number of the original knot. In this talk, we discuss this question.

July 27 Monday

On connected components of the lower decker sets of surface diagrams

Tsukasa Yashiro (Sultan Qaboos University)

A surface-knot is a closed oriented surface embedded in 4-space. A surface diagram of a surface-knot is the projected image in 3-space under the orthogonal projection with crossing information. The pre-image of multiple point sets of a surface diagram is called a double decker set that is the union of lower and upper decker sets. The lower decker set induces a complex consisting of rectangular cells. If the surface-knot is colorable by a quandle, then the complex is also colorable by the quandle. In this talk, we discuss about the coloring homomorphisms induced by the coloring on the complex. If the surface-knot is double twist spun of (2, k)-torus knot for odd $k > 1$, then we will show that the number of non-trivially colored non-degenerate connected lower decker sets can be determined.

The most symmetric surfaces in three dimensional torus

Shicheng Wang (Peking University)

We will address the problem indicated in the title and its relation with triply periodic minimal surfaces in the 3-space.

Multivariable Alexander polynomial for handcuff graphs

Shin'ya Okazaki (OCAMI)

A handlebody-knot is a handlebody embedded in the 3-sphere. Last year, the speaker introduced an invariant for handlebody-knots which comes from the multivariable Alexander invariant and showed there exist infinitely many handlebody-knots which are classified by this invariant. Unfortunately, this invariant of many handlebody-knots in the table by A. Ishii, K. Kishimoto, H. Moriuchi and M. Suzuki is trivial, because the multivariable Alexander invariant is trivial for such handlebody-knots. Any genus two handlebody-knot has a representation by a handcuff graph. In this talk, we show why the multivariable Alexander invariant is trivial for many handlebody-knots in this table by using a property of handcuff graph and we consider the multivariable Alexander invariant for handcuff graphs to construct more examples of handlebody-knots which are classified by the invariant.

July 28 Tuesday

The Krull dimension of composite power series ring $A + XI[\![X]\!]$

Jung Wook Lim (Kyungpook National University)

Let R be a commutative ring with identity, I a nonzero proper ideal of R, and $R + XI[\![X]\!]$ a composite power series ring. In this talk, we give some results on the calculation of Krull dimension of a composite power series rings.

Some polynomial invariants of welded links

Young Ho Im (Pusan National University)

We give a quotient of the ring $\mathbb{Q}[A^{\pm 1}, t^{\pm 1}]$ so that the Miyazawa polynomial is a non-trivial invariant of welded links. Furthermore we show that this is also an invariant under the other forbidden move F_u, and so it is a fused isotopy invariant. Also, we give some quotient ring so that the index polynomial can be an invariant for welded links.

Seifert surgery on knots via Reidemeister torsion and Casson-Walker-Lescop invariant

Teruhisa Kadokami (East China Normal University)

For a knot K with $\Delta_K(t) \doteq t^2 - 3t + 1$ in a homology 3-sphere, let M be the result of $2/q$-surgery on K. We show that an appropriate assumption on the Reidemeister torsion of the universal abelian covering of M implies $q = \pm 1$, if M is a Seifert fibered space. This is joint work with Noriko Maruyama (Musashino Art University) and Tsuyoshi Sakai (Nihon University).

July 29 Wednesday

Shadow biquandle cocycle invariants of oriented links and surface-links

Jieon Kim (Pusan National University)

L. H. Kauffman and D. E. Radford introduced a generalization of quandles, called biquandles. In 2003, J. S. Carter, M. Elhamdadi and M. Saito defined a (co)homology theory and cocycle invariants for biquandles. In 2008, J. S. Carter, S. Kamada and M. Saito introduced shadow quandle colored diagram and shadow quandle cocycle invariants of oriented links and surface-links. In this talk, we'd like to introduce shadow biquandle colored diagrams. Using this, we define shadow biquandle cocycle invariants of oriented links and surface-links. This is a joint work with S. Y. Lee.

Ribbon disks with the same exterior

Tetsuya Abe (OCAMI)

A classical Gluck's theorem states that there exist at most two inequivalent 2-knots with diffeomorphic exteriors. In this talk, we construct infinitely many ribbon disks with the same exterior. First, we give a sufficient condition for a given slice disk to be ribbon. Next, we construct infinitely many slice disks with the same exterior, and prove that these are ribbon. This is a joint work with Motoo Tange.

The Γ-polynomials of Abe-Tange's ribbon knots

Hideo Takioka (OCAMI)

Abe and Tange constructed a sequence of (2-dimensional) ribbon disks whose exteriors are the same. They proved that the sequence contains infinitely many distinct ribbon disks. In this talk, we show that all ribbon disks in the sequence are mutually distinct by using the Γ-polynomial, that is, the common zeroth coefficient polynomial of both the HOMFLYPT and Kauffman polynomials.

July 30 Thursday

Non-existence of invariant Morse functions via representation coverings

Hitoshi Yamanaka (OCAMI)

For a compact smooth manifold having a smooth action of a compact Lie group, an open covering of the manifold indexed by the fixed point set is called a representation covering if each open set is equivariantly diffeomorphic to the tangencial representation at the corresponding fixed point. We first show that a representation covering exists if the manifold admits an equivariant hyperbolic diffeomorphism satisfying a certain convergence condition. Then, as an application of this result, it is revealed that there are infinitely many torus manifolds which never admit invariant Morse functions. This is in contract to the classical result of Morse and of Wasserman concerning existence of invariant Bott-Morse functions.

Virtual surface-links in four space

Sang Youl Lee (Pusan National University)

A marked graph diagram is a link diagram possibly with marked 4-valent vertices. S. J. Lomonaco, Jr. and K. Yoshikawa introduced a method of presenting surface-links by marked graph diagrams. A virtual marked graph diagram is a marked graph diagram possibly with virtual crossings indicated by small circles as usual in virtual link diagrams. Recently, L. H. Kauffman formulated a theory of isotopy of virtual surface-links in four space by means of virtual marked graph diagrams modulo a generalization of the Yoshikawa moves on marked graph diagrams. One of the projects of this proposal is to investigate the relationships between this diagrammatic definition and more geometric approaches to virtual 2-knots due to J. Schneider and to Y. Takeda. In this talk, I would like to take a glance at this theory and introduce a method of constructing isotopy invariants for virtual surface-links in four space.