

Workshop Differential Topology

The Univ. of Electro-Comm (Room: NewC403) 1-5-1 Chofu-ga-oka, Chofu, Tokyo
28 – 31, March, 2017

3/28 (Preworkshop for graduates (in Japanese))

3/29-31 (Workshop for experts (in English))

Subject : Heegaard Floer homology and its related topics

Keywords : Heegaard Floer homology, L-space, contact structure, concordance invariant

Schedule

	28 Tue.	29 Wed.	30 Thu.	31 Fri.
10:00–11:00	M. Tange	K. Ichihara	K. Park	D. Krcatovich
11:20–12:20	Y. Bao	H. Matsuda	Z. Wu	K. Sato
	Lunch	Lunch	Lunch	Lunch
14:20–15:20	K. Sato	Y. Bao	T. Oba	
15:40–16:40	Y. Nakae	Z. Wu	K. Motegi	
17:00–18:00	T. Abe	M. Kim	T. Ito	

28 Tuesday

10:00–11:00 **Motoo Tange** (University of Tsukuba)

Introduction to Heegaard Floer homology

11:20–11:20 **Yuanyuan Bao** (The University of Tokyo)

The Heegaard Floer homology for a knots, link and 3-manifold with boundary

14:20–15:20 **Kouki Sato** (Tokyo Institute of Technology)

A survey of knot concordance invariants from Heegaard Floer homology

15:40–16:40 **Yasuharu Nakae** (Akita University)

Taut foliations, its properties and constructions

17:00–18:00 **Tetsuya Abe** (Osaka City University)

Knot Floer homology and the enhancement to the Milnor number

29 Wednesday

10:00–11:00 **Kazuhiro Ichihara** (Nihon University)

Non-leftordarable surgeries on twisted torus knots

11:20–11:20 **Hiroshi Matsuda** (Yamagata University)

Homological invariants of surface-knots

- 14:20–15:20 **Yuanyuan Bao** (The University of Tokyo)
The Alexander polynomial of the balanced bipartite graph
- 15:40–16:40 **Zhongtao Wu** (The Chinese University of Hong Kong)
Some minimal genus problems in low dimensional topology
- 17:00–18:00 **Min Hoon Kim** (KIAS, Korea)
On the bipolar filtration of topologically slice knots
- 18:30– Banquet En'ya at Chofu North

30 Thursday

- 10:00–11:00 **Kyungbae Park** (KIAS, Korea)
Surgery obstructions and Heegaard Floer theory
- 11:20–11:20 **Zhongtao Wu** (The Chinese University of Hong Kong)
Some minimal genus problems in low dimensional topology
- 14:20–15:20 **Takahiro Oba** (Tokyo Institute of Technology)
Survey of Heegaard Floer homologies and contact structures
- 15:40–16:40 **Kimihiko Motegi** (Nihon University)
Twistings, band-sums and L -space surgeries
- 17:00–18:00 **Tetsuya Ito** (Osaka University)
 L -space and left-ordering

31 Friday

- 10:00–11:00 **David Krcatovich** (Rice University)
Cobordisms of knots, braid index, and the Upsilon invariant
- 11:20–11:20 **Kouki Sato** (Tokyo Institute of Technology)
A full-twist inequality for the nu_+ invariant

the End of the Program

Organizers :

Tetsuya ABE (Osaka City University),
Motoo TANGE (University of Tsukuba),
Yuichi YAMADA (The Univ. of Electro-Comm.)

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Abstracts

Motoo Tange (University of Tsukuba)

Introduction to Heegaard Floer homology

Abstract: In this lecture we begin with the definition of Heegaard Floer homology for any closed 3-manifold and includes some invariants and application. We also give a definition of correction term and several computations and applications, for example, plumbed 3-manifolds and Dehn surgeries of a knot.

Yuanyuan Bao (The University of Tokyo)

The Heegaard Floer homology for a knots, link and 3-manifold with boundary

Abstract: On the presupposition that Heegaard Floer homology (HF) for a closed 3-manifold has been introduced, in this talk, we will review the definition of the HF for a link and knot and its properties. This definition turns out to be a special case of the HF for a 3-manifold with boundary. If time allows, we will briefly introduce the definition of the HF for a 3-manifold with boundary (mainly sutured Floer homology and bordered Floer homology).

Kouki Sato (Tokyo Institute of Technology)

A survey of knot concordance invariants from Heegaard Floer homology

Abstract: In this talk, we discuss several knot concordance invariants derived from Heegaard Floer homology. In particular, we focus on the correction terms of Dehn surgeries, Ni-Wu's V_k invariants and Hom-Wu's ν^+ invariant.

Yasuharu Nakae (Akita University)

Taut foliations, its properties and constructions

Abstract: Let \mathcal{F} be a codimension one foliation of a closed 3-manifold M . \mathcal{F} is called a taut foliation if all leaves of \mathcal{F} have a closed transversal. By the definition, \mathcal{F} has no Reeb component. Then a taut foliation \mathcal{F} is Reebless and it has some properties that the fundamental group of M is infinite, M is irreducible and the universal cover of M is homeomorphic to 3-dimensional Euclid space by the theorems of Novikov, Rosenberg and Palmeira. I will explain these properties and some example of construction of taut foliations on 3-manifolds, especially focus on a knot complement. If there is a time, I will explain a relation between an L-space and existence of taut foliations.

Tetsuya Abe (Osaka City University)

Knot Floer homology and the enhancement to the Milnor number

Abstract: First, I will explain basic facts on fibered links and contact structures. Secondly, I will explain the relation between the enhancement to the Milnor number of fibered knots (or the d_3 -invariant of fibered knots) and the Knot Floer homology of fibered knots.

Kazuhiro Ichihara (Nihon University)

Non-leftorderable surgeries on twisted torus knots

Abstract: The well-known L-space conjecture says that an irreducible rational homology 3-sphere is an L-space if and only if its fundamental group is not left-orderable. One of the known approaches to the conjecture is by using Dehn surgery. In this talk, I will talk about Dehn surgeries on twisted torus knots yielding 3-manifolds with non-leftorderable fundamental groups. This talk is based on joint works with Yuki Temma and Yasuharu Nakae.

Hiroshi Matsuda (Yamagata University)

Homological invariants of surface-knots

Abstract:

Yuanyuan Bao (The University of Tokyo)

The Alexander polynomial of the balanced bipartite graph

Abstract: The Alexander polynomial is one of the most classical knot invariants. It has both classical and modern interpretations. In classical case for example, it can be defined from the universal abelian covering of the knot complement, while in modern case, it has super $sl(1, 1)$ model, Burau representation model etc. For a balanced bipartite graph, we defined its Heegaard Floer homology, and we call its Euler characteristic the Alexander polynomial of the graph. In this talk, we aim to discuss different interpretations of this polynomial.

Zhongtao Wu (The Chinese University of Hong Kong)

Some minimal genus problems in low dimensional topology

Abstract: I plan to give a series of talk on minimal genus problems in low dimensional topology. we will discuss the notion of the rational genus of a knot and focus on the minimal genus problem for knots in a rational homology three-sphere that represent a given homology class. This is joint work with Yi Ni.

Min Hoon Kim (KIAS, Korea)

On the bipolar filtration of topologically slice knots

Abstract: Celebrated theorems of Freedman and Donaldson have an immediate corollary that there is a topologically slice knot which is not smoothly slice. Let \mathcal{T} be the subgroup of the smooth knot concordance group of topologically slice knots. Understanding the structure of \mathcal{T} is of fundamental importance since \mathcal{T} measures the subtle difference between topological and smooth category in dimension 4. Cochran, Harvey and Horn proposed a beautiful framework to study \mathcal{T} systematically by introducing a geometrically defined filtration on \mathcal{T} which is called the bipolar filtration. Cochran, Harvey and Horn could interpret many knot concordance invariants in terms of the bipolar filtration. Up to now, the non-triviality of this filtration was settled only at the zeroth level and the first level. In this talk, we prove that the bipolar filtration on \mathcal{T} is highly non-trivial at every level. The proof involves both Cheeger-Gromov L^2 ρ -invariants and Heegaard Floer d -invariants. This is joint work with Professor Jae Choon Cha.

Kyungbae Park (KIAS, Korea)

Surgery obstructions and Heegaard Floer theory

Abstract: It is well known that any closed oriented 3-manifold can be obtained by surgery on a link in the 3-sphere. It is hard in general to answer: Which 3-manifolds can, or cannot, be obtained by surgery on a knot (single component link)? In this talk, we will survey results related to this question, responded by using Heegaard Floer theory. We also introduce our result on 3-manifolds with the first betti-number 1. This is a joint work with Matt Hedden and Min Hoon Kim.

Zhongtao Wu (The Chinese University of Hong Kong)

Some minimal genus problems in low dimensional topology

Abstract: I plan to give a series of talk on minimal genus problems in low dimensional topology. we will discuss the notion of the rational genus of a knot and focus on the minimal genus problem for knots in a rational homology three-sphere that represent a given homology class. This is joint work with Yi Ni.

Takahiro Oba (Tokyo Institute of Technology)

Survey of Heegaard Floer homologies and contact structures

Abstract: Ozsbáth and Szabó introduced an invariant for a given contact 3-manifold by using Heegaard Floer homologies. In this talk, first we recall the definition of this invariant, and then we review some properties and results of this invariant. Particular, we exhibit an alternative description of this invariant given by Honda, Kazez and Matic.

Kimihiko Motegi (Nihon University)

Twistings, band-sums and L-space surgeries

Abstract: Twisting operations and band-sum operations enable us to create new knots from given ones. We will discuss if we can obtain L-space knots using these operations. We give a necessary and sufficient condition for a twist family of knots to contain infinitely many L-space knots. We also prove that a non-trivial band sum never yields an L-space knot. This generalizes Krcatovich's result which asserts that a non-trivial connected sum never yields an L-space knot.

This is joint work with Ken Baker.

Tetsuya Ito (Osaka University)

L-space and left-ordering

Abstract: It is conjectured that the fundamental group of 3-manifold is non-left-orderable if and only if it is L-space. In this talk I will review basic of left-ordering on group and how it is (expected to be) related to topology and geometry of 3-manifolds.

David Krcatovich (Rice University))

Cobordisms of knots, braid index, and the Upsilon invariant

Abstract: If two knots occur as intersections of a given algebraic curve in C^2 with concentric three-spheres, they are connected by a cobordism whose genus is the difference of the slice genera of the two knots. A cobordism with this genus is called optimal. We use the Upsilon invariant of Ozsvath-Stipsicz-Szabo to obstruct the existence of optimal cobordisms. In doing so, we generalize a result of Morton-Franks-Williams on the minimal braid index of knots with a "full twist", and show that in some cases Upsilon can provide a lower bound on the braid index of any representative in a concordance class of knots. This is joint work with Peter Feller.

Kouki Sato (Tokyo Institute of Technology)

A full-twist inequality for the ν^+ invariant

Abstract: Hom and Wu introduced a knot concordance invariant called ν^+ , which dominates many concordance invariants derived from Heegaard Floer homology. In this talk, we give a full-twist inequality for ν^+ . By using the inequality, we extend Wu's cabling formula for ν^+ (which is proved only for particular positive cables) to all cables in the form of an inequality. In addition, we also discuss ν^+ -equivalence, which is an equivalence relation on the knot concordance group. We introduce a partial order on ν^+ -equivalence classes, and study its relationship to full-twists.

The End