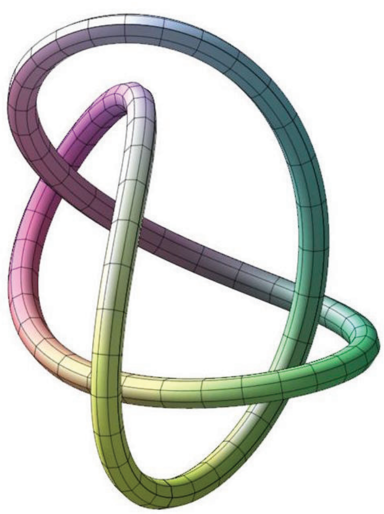
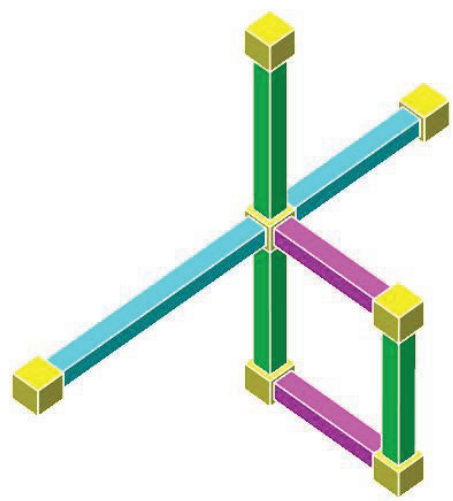
Knots and Spatial Graphs 2015

November 5-7, 2015
KAIST, Daejeon Korea
Natural Science Bldg E6-1, Rm 1409





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KAIST Center for Mathematical Challenges (KAIST CMC)

Thrusday Afternoon, November 5 (Room 2412)

15:50 – 16:00	Opening
16:00 – 16:40	Byunghee An
	Grid diagrams for singular knots
16:50 – 17:30	Alexander Stoimenow
	Roots of the Alexander polynomial and Hoste's conjecture
17:30 – 17:50	Coffee Break
17:50 – 18:30	HyoWon Park
	A class of right-angled Artin groups
18:50 –	DINNER

Friday Morning, November 6 (Room 1409)

09:30 – 10:10	Elizabeth Denne
	The ribbonlength of knot diagrams
10:20 – 11:00	Sang-Jin Lee
	Immersions of graphs and embedding between RAAGs
11:00 – 11:20	Coffee Break
11:20 – 12:00	Sangyop Lee
	Composite knots obtained by twisting torus knots
12:00 –	LUNCH

Friday Afternoon, November 6 (Room 1409)

14:00 – 14:40	Hun Kim
	Lattice Knot and It's Surfaces
14:50 – 15:30	Seungsang Oh
	New enumeration algorithm on lattice combinatorics
15:30 – 15:50	Coffee Break
15:50 – 16:30	Jae Choon Cha
	Complexities of 3-manifolds
16:40 – 17:20	Taehee Kim
	Knot concordance and gropes
18:00 –	DINNER

Saturday Morning, November 7 (Room 1409)

09:30 – 10:10	Hideo Takioka
	The cable Γ*-polynomial of a knot*
10:20 – 11:00	Jung Hoon Lee
	Bridge splittings and topologically minimal surfaces
11:00 – 11:20	Coffee Break
11:20 – 12:00	Hwa Jeong Lee
	On the arc index of cable links and Whitehead doubles

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Byunghee An
Institute for Basic Science, Center for Geometry and Physics

Grid diagrams for singular knots

A grid diagram is a link diagram of vertical strands and the same number of horizontal strands with the properties that at every crossing the vertical strand crosses over the horizontal strand and no two horizontal segments are co-linear and no two vertical segments are co-linear. It is known that every knot admits a grid diagram, and moreover, so do the relatives such as Legendrian knots, transverse knots, closures of braids, as well. Indeed, Ng and D. Thurston in 2009 showed that all these knot theories can be obtained from the set of grid diagrams up to appropriate sets of moves, respectively. In this talk, we consider the generalization of this result to singular knots. This is a joint work with Hwajeong Lee.

Jae Choon Cha
POSTECH

Complexities of 3-manifolds

We discuss several notions of complexities of 3-manifolds which are related to combinatorial, knot theoretical, and geometric group theoretical data.

Elizabeth Denne
Washington & Lee University

The ribbonlength of knot diagrams

The ropelength problem asks to minimize the length of a knotted space curve such that a unit tube around the curve remains embedded. A two-dimensional analog has a much more combinatorial flavor: we require a unit-width ribbon around a knot diagram to be immersed with consistent crossing information. The ribbonlength is the length of the diagram divided by the width. In this talk I will introduce all these ideas, and show how attempting to characterize critical points for ribbonlength leads us to new results about the medial axis of an immersed disk in the plane, including a certain topological stability for thin disks. This is joint work with John M. Sullivan and Nancy Wrinkle.

Hun Kim

Korea Science Academy

Lattice Knot and It's Surfaces

A lattice knot on the simple cubic lattice is a piecewise linear, simple closed curve. Further, each linear piece of this polygon is a unit length segment with its endpoints on the cubic lattice. Especially, Hamiltonian lattice knot is defined as a lattice knot which is a Hamiltonian cycle in an $l \times m \times n$ lattice. In this talk, we will introduce a result about Hamiltonian lattice knots. Moreover we will investigate spanning surfaces and seifert surfaces of lattice knots in $(R \times R \times Z) \cup (R \times Z \times R) \cup (Z \times R \times R)$.

Taehee Kim

Konkuk University

Knot concordance and gropes

A (symmetric) grope is a certain 2-complex equipped with the notion of height. Using gropes in the 4-ball which bound a knot in the 3-sphere, one can define the filtration of the knot concordance group. In this talk, I will explain knot concordance and the structure of this filtration. In particular, I will talk about how to show the non-triviality of each level of the filtration.

Hwa Jeong Lee

KAIST

On the arc index of cable links and Whitehead doubles

In this talk, we construct an algorithm to produce "canonical grid diagrams" of cable links and Whitehead doubles. We show that the algorithm correctly determines the arc index of 2-cable links and Whitehead doubles of all prime knots with up to 8 crossings. This is a joint work with Hideo Takioka.

Jung Hoon Lee

Chonbuk National University

Bridge splittings and topologically minimal surfaces

We introduce bridge splittings and topologically minimal surfaces, and show that if a bridge surface for a knot is an index n topologically minimal surface, then after a perturbation it is still topologically minimal with index at most $n + 1$.

Sang-Jin Lee

Konkuk University

Immersions of graphs and embedding between RAAGs

For a finite graph Γ, let $G(\Gamma)$ denote the right-angled Artin group on the complement graph of Γ. In the talk, we introduce the notions of "induced path lifting property" and "semi-induced path lifting property" for immersions of graphs, and apply them to embedability between right-angled Artin groups. We recover the result of Sang-hyun Kim and Thomas Koberda that for any finite graph Γ, $G(\Gamma)$ admits a quasi-isometric group embedding into $G(T)$ for some tree T. The upper bound for the number of vertices of T is improved from a double exponential function in the number of vertices of Γ to an exponential function.

Sangyop Lee

Chung-Ang University

Composite knots obtained by twisting torus knots

A twisted torus knot is obtained from a torus knot by twisting some adjacent parallel strands of the torus knot. We characterize twisted torus knots which are composite knots.

Seungsang Oh

Korea University

New enumeration algorithm on lattice combinatorics

In this talk, we introduce the state matrix recursion algorithm. This algorithm proceeds with recurrence relations of state matrices, which turn out to be remarkably efficient for the enumeration of two-dimensional regular lattice models such as dimers and trimers, independent vertex and edge sets, multiple self-avoiding walks and polygons, squares and rectangles with various sizes,and quantum knot mosaics in a rectangular region.

HyoWon Park

PMI

A class of right-angled Artin groups

Let C be the class of right-angled Artin groups(RAAGs) whose defining graphs have no C_4 and P_3 as full subgraphs. Here C_4 is the circuit of length 4 and P_3 is the path of length 3. RAAGs in C satisfy algebraic properties : subgroup separable, coherence, and etc. Furthermore, the class gives a necessary and sufficient condition for RAAGs that satisfy some properties. We show that a RAAG is in C if and only if its every finite index subgroup is a RAAG.

Alexander Stoimenow

GIST

Roots of the Alexander polynomial and Hoste's conjecture

The Alexander polynomial remains one of the most fundamental invariants of knots and links in 3-space. It topological understanding has led a long time ago to the insight what (Laurent) polynomials occur as Alexander polynomial of an arbitrary knot. Ironically, the question to characterize the Alexander polynomials of alternating knots turns out to be far more difficult, even although in general alternating knots are much better understood. Hoste, based on computer verification, made the following conjecture about 10 years ago: If z is a complex root of the Alexander polynomial of an alternating knot, then $\mathrm{Re} z > -1$. We discuss some results toward this conjecture, about 2-bridge (rational) knots or links, 3-braid alternating links, and Montesinos knots.

Hideo Takioka

Osaka City University

The cable Γ-polynomial of a knot

We consider the cable Γ-polynomial of a knot. The Γ-polynomial is the common zeroth coefficient polynomial of both the HOMFLYPT and Kauffman polynomials. I will talk about the 2-cable Γ-polynomials of Kanenobu knots and the 3-cable Γ-polynomials of mutant knots.