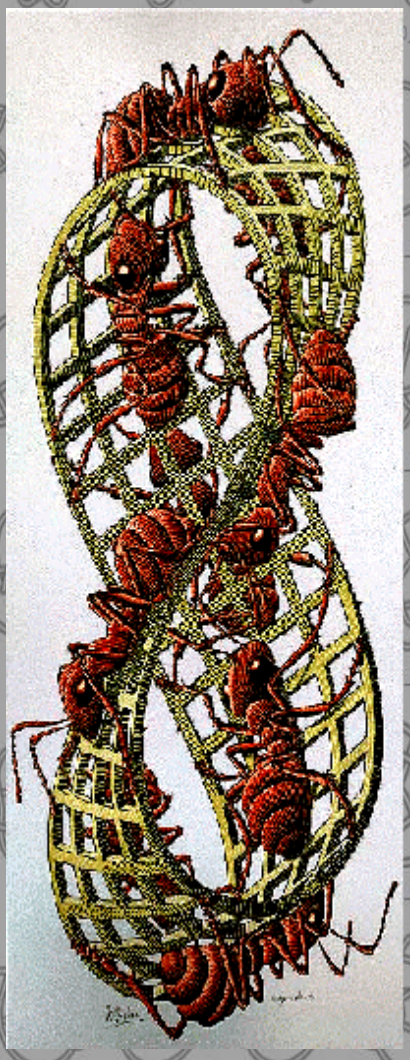
2016 Winter TAPU Workshop on Knots and Related Topics



15(Mon)-16(Tue) February, 2016

Natural Science Building, Room 219
College of Natural Sciences
Kyungpook National University

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BK21+ Next CMC, KNU
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SCHEDULE

15(Mon) February 2016

09:25-09:30 **Opening**

09:30-10:20 **Chair :Y. Bae**
Sang Youl Lee (Pusan National University)
The Quantum A_2 Invariant for Virtual Tangled Trivalent Graph Diagrams

10:40-11:10 **Chair :Y. Bae**
Myeong-Ju Jeong (KAIST)
An Even Polynomial and Bridge Diagrams

11:20-11:50 **Chair :Y. Bae**
Seogman Seo (Kyungpook National University)
Virtual Links and Graphs

11:50-13:30
Lunch

13:30-14:30 **Chair :S.Y. Lee**
Kengo Kawamura (Osaka City University)
Modification of Quandle (Co)HomologyGroups for Immersed Surface-knots

Byeorhi Kim (Kyungpook National University)
On Finite Quandles and Their Inner Automorphism Groups

Jihee Kim (Pusan National University)
Index Polynomials for Gauss Diagrams of Virtual Links and Utilization

Suhyeon Jeong (Pusan National University)
Parities and an Odd Polynomial Invariant for Virtual Links and Utilization

14:50-15:40 **Chair :S.Y. Lee**
Myoungsoo Seo (Kyungpook National University)
On the Writhes of Periodic Virtual Knots

Colloquium

16:00-16:50 **Chair :Y. Bae**
Seiichi Kamada (Osaka City University)
On Braid Description of Surface-links in the 4-space

17:00 -
Free Discussion and Dinner

16(Tue) February 2016

09:30-10:20 **Chair :C.-Y. Park**

Yukio Matsumoto (Gakushuin University)

Riemann Surfaces and Crystallographic Groups

10:40-11:30 **Chair :C.-Y. Park**

Sangyop Lee (Chung-Ang University)

Twisted Torus Knots

11:40-13:30

Lunch

13:30-14:30 **Chair :M. Seo**

Kaori Hasegawa (Osaka City University)

CocycleInvariants of the Dihedral Qualgebra of Order 6

Seonmi Choi (Kyungpook National University)

On Finite Quandles and Rack Homology Groups

Hyeran Cho (Pusan National University)

Obtaining a Presentation of Knot Groups by WirtingerPresentation

Geunyoung Kim (Pusan National University)

An Index Definition of Parity Mappings of a Virtual Link Diagram and Utilizations

14:50-15:40 **Chair :Y. Bae**

Akio Kawauchi (OCAMI, Osaka City University)

On a Cross-sectional Link of an Immersed Sphere-link in 4-space

16:30 -

Free Discussion and Dinner

ABSTRACT

Hyeran Cho (Pusan National University)
Obtaining a Presentation of Knot Groups by Wirtinger Presentation

Abstract: We introduce Wirtinger presentation which is a method to find a group presentation of a knot group and consider some of its examples given in [Gerhard Burde and Heiner Zieschang, Knots, 32-37pp.].

Seonmi Choi (Kyungpook National University)
On Finite Quandles and Rack Homology Groups

Abstract: Let Q be a finite set and let $\{*_{1}, *_{2}, \cdots, *_{m}\}$ be the set of all quandle operations of Q. The product $*_{i}*_{j}$ of two quandle operations $*_{i}$ and $*_{j}$ can be defined by x $*_{i}*_{j}$ $y=(x*_{i}y)*_{j}y$ for every $x, y \in Q$.In this talk, we will introduce an algebraic structure on the set $\{*_{1}, *_{2}, \cdots, *_{m}\}$ of quandle operations and study their rack homology groups.

Kaori Hasegawa (Osaka City University)
Cocycle Invariants of the Dihedral Qualgebra of Order 6

Abstract: A qualgebra is a quandle with a multiplication. By using a qualgebra, V. Lebed defined colorings and cocycle invariants of spatial trivalent graphs. We consider the qualgebra obtained from the dihedral group of order 6. We show some examples of shadow 2-cocycles of the qualgebra, and calculate cocycle invariants for some spatial trivalent graphs.

Myeong-Ju Jeong (KAIST)
An Even Polynomial and Bridge Diagrams

Abstract: I have introduced bridge diagram of a virtual knot diagram. For each virtual knot diagram, we can associate a bridge diagram obtained by introducing a bridge with a sign for each crossing.I will introduce a polynomial invariant of virtual knots by considering weights of a bridge. It gives us a Vassiliev invariant distinguished from the affine index polynomial and the zero polynomial.

Suhyeon Jeong (Pusan National University)
Parities and an Odd Polynomial Invariant for Virtual Links and Utilization

Abstract:We introduce the odd Jones-Kauffman polynomial of virtual link diagrams by using the parity of virtual link diagrams given in [Y. H. Im and K. I. Park, A parity and a multi-variable polynomial invariant for virtual links, J. Knot Theory Ramifications 22(13) (2013), Article ID: 1350073, 18pp.], which are different from the original Jones-Kauffman polynomial.

Seiichi Kamada (Osaka City University)
On Braid Description of Surface-links in the 4-space

Abstract:We discuss about braid presentations of surface-linksin the Euclidean 4-space. First we introduce the classical dimensionalcase. Alexander and Markov's theorems state that every link in theEuclidean 3-space can be presented as a closed braid (the closure of abraid), and such a braid presentation is unique up to braid ambientisotopy, conjugation and stabilization. An analogous

result holds forsurface-links in the 4-spcae. Every surface-link can be presented as aclosed surface-braid and such a braid presentation is unique up to braidambient isotopy, conjugation and stabilization.

Kengo Kawamura (Osaka City University)
Modification of Quandle (Co)Homology Groups for Immersed Surface-knots

Abstract: An immersed surface-knot is an oriented closed connected surface generically immersed in a 4-space. In this talk, we introduce a modification of quandle (co)homology groups which is closely related to diagrams of immersed surface-knots.

Akio Kawauchi (OCAMI, Osaka City University)
On a Cross-sectional Link of an Immersed Sphere-link in 4-space

Abstract: The torsion Alexander polynomial and the local signature of a cross-sectional link of an immersed 2-link are investigated from the viewpoint of how to influence to the immersed 2-link. It is shown that the torsion Alexander polynomial of a symmetric middle cross-sectional link of a ribbon 2-link is a topological invariant of the ribbon2-link. A generalization to an immersed 2-link is also shown.

Byeorhi Kim (Kyungpook National University)
On Finite Quandles and Their Inner Automorphism Groups

Abstract: Let Qbe a finite set. Let $*_{1}$ and $*_{2}$ be two quandle operations on Q. Then the product $*_{1}*_{2} : Q \timesQ \rightarrowQ$ defined by
$a *_{1}*_{2} b = (a* _{1}b)*_{2}b$ for all $a, b \in Q$, is not a quandle operation in general.
In this talk, we will study therelationship between the inner automorphism groups $Inn(Q, *_{1}), Inn(Q, *_{2})$ and $Inn(Q, * _{1}*_{2})$ in the case that $(Q, * _{1}*_{2})$ is a quandle.

Geunyoung Kim (Pusan National University)
An Index Definition of Parity Mappings of a Virtual Link Diagram and Utilizations

Abstract: H.Dye defined the parity mapping for a virtual knot diagram, which is a map from the set of real crossings of the diagram to $\mathbb{Z}$.The notion generalizes the parity which is studied extensively by V.Manturov. The mapping induces the i-th writhe $(i\in \mathbb{Z}\setminus \{0\})$which is an invariant of the representing virtual knot.She applied the parity mapping to introduce a gradeto the Henrich S-invariant for a virtual knot, and showed that the invariants are Vassiliev invariants of degree one. Following it,we define the parity mappings for a virtual link diagram, anddefine the similar invariants as above for a virtual link by using the parity mappings.

Jihee Kim (Pusan National University)
Index Polynomials for Gauss Diagrams of Virtual Links and Utilization

Abstract:We introduce the index polynomial for Gauss diagrams corresponding virtual links, which is easier to calculate than that of virtual links.

Sangyop Lee (Chung-Ang University)
Twisted torus knots
Abstract: Twisted torus knots are obtained by adding full twists to some parallel strands of torus knots. We will discuss some properties of these knots.

Sang Youl Lee (Pusan National University)
The Quantum A_2 Invariant for Virtual Tangled Trivalent Graph Diagrams

Abstract:A tangled trivalent graph diagram is an oriented link diagram possibly with some trivalent vertices whose incident edges are oriented all inward or all outward. G. Kuperberg derived an inductive, combinatorial definition of a polynomial-valued invariant, called the quantum A_2 invariant, with values in the ring of one variable integral Laurent polynomials, which is an invariant for regular isotopy of tangled trivalent graph diagrams.
In this talk, I would like to talk about an extension of the quantum A_2 invariant to virtual tangled trivalent graph diagrams and some applications.

Yukio Matsumoto (Gakushuin University)
Riemann Surfaces and Crystallographic Groups

Abstract: A Riemann surface is a closed surface with a complex structure, while a crystallographic group is an isometry group acting on a Euclidean space$\mathbb{E}^n$ whose translation subgroup forms an n-dimensionallattice. For example, a so-called wall paper group is atwo dimensional crystallographic group.This talk will report our recent discovery that certain crystallographic groups on $\mathbb{E}^{3g-3}$naturally arize from a Riemann surface of genus g.

Myoungsoo Seo (Kyungpook National University)
On the Writhes of Periodic Virtual Knots

Abstract:In 2014, Satoh and Taniguchi defined the *n*-th writhe of a virtual knot for each non-zero integer *n* and proved that the *n*-th writhe is a generalization of the index polynomial and the odd writhe polynomial. In this talk, we will review the *n*-th writhe of a virtual knot for each non-zero integer *n* and discuss some properties of the *n*-th writhe of periodic virtual knots.

Seogman Seo (Kyungpook National University)
Virtual Links and Graphs

Abstract: In this talk, I introduce a correspondence between virtual links and graphs which is given by Jablan, Radović and Sazdanović in 2011. By using this correspondence, I would like to introduce new virtual link invariants derived from topological indices; The weiner index and the harary index.