研究集会　Intelligence of Low-dimensional Topology

京都大学数理解析研究所 RIMS 研究集会として、また、大阪市立大学数学研究所から後援をうけて、トポロジープロジェクトの一環として、標記の研究集会を開催いたします。また、この研究集会は科学研究費補助金 基盤研究 B 「グラフィクスとカンドル理論の観点からの４次元トポロジーの研究」（課題番号 21340015、研究代表者 鎌田聖一氏（大阪市立大学））と科学研究費補助金 基盤研究 B 「結び目と３次元多様体のトポロジー」（課題番号 24340012、研究代表者 大槻知忠（京都大学））の援助をうけています。

日程：２０１３年5月２２日（水）～ ２４日（金）
場所：京都大学 数理解析研究所 420 大講演室
アクセス：http://www.kurims.kyoto-u.ac.jp/ja/access-01.html

５月２２日（水）

13:20～14:10　Sergio Fenley（Florida State University / Princeton University)
Knot theory of R-covered Anosov flows: Homotopy versus isotopy of closed orbits

14:30～15:20　井上 歩 （愛知教育大学 数学教育講座）
On the availability of quandle theory to classifying links up to link-homotopy

15:40～16:30　茂手木 公彦 （日本大学 文理学部）
Hyperbolic knots with left-orderable, non–L–space surgeries (joint work with Masakazu Teragaito)

５月２３日（木）

10:00～10:50　寺垣内 政一 （広島大学）
Left-orderable fundamental groups and Dehn surgery on two-bridge knots

11:10～12:00　寺嶋 郁二 （東京工業大学 情報理工学研究科）
Torsions from cluster transformations

13:20～14:10　藤 博之 （東京大学 数理科学研究科）
Colored HOMFLY homology and super-A-polynomial

14:30～15:20　Rinat Kashaev（Université de Genève)
Edge state integrals on shaped triangulations

15:40～　　Problem Session

５月２４日（金）

10:00〜10:50　伊藤 哲也 （京都大学 数理解析研究所）
Quantum representations of braid groups and Garside structure

11:10〜12:00　水澤 篤彦 （早稲田大学）
Yokota type invariants derived from Costantino-Murakami's invariants

13:20〜14:10　森内 博正 （大阪市立大学 数学研究所）
A table of coherent band-Gordian distances between knots

14:30〜15:20　樋上 和弘 （九州大学）
Cluster algebra and complex volume

組織委員： 河内明夫、河野俊丈、金信泰造、鎌田聖一、大槻知忠

世話人：　大槻知忠（京大数理研）、和久井道久（関西大学）、北山貴裕（東大数理）

Intelligence of Low-dimensional Topology

May 22–24, 2013
Room 420, RIMS, Kyoto University
Access: http://www.kurims.kyoto-u.ac.jp/en/access-01.html

Program

May 22 (Wed)

13:20–14:10 Sergio Fenley (Florida State University / Princeton University)
Knot theory of R-covered Anosov flows: Homotopy versus isotopy of closed orbits

14:30–15:20 Ayumu Inoue (Department of Mathematics Education, Aichi University of Education)
On the availability of quandle theory to classifying links up to link-homotopy

15:40–16:30 Kimihiko Motegi (Nihon University)
Hyperbolic knots with left-orderable, non–L–space surgeries (joint work with Masakazu Teragaito)

May 23 (Thu)

10:00–10:50 Masakazu Teragaito (Hiroshima University)
Left-orderable fundamental groups and Dehn surgery on two-bridge knots

11:10–12:00 Yuji Terashima (Tokyo Institute of Technology)
Torsions from cluster transformations

13:20–14:10 Hiroyuki Fuji (Graduate School of Mathematical Sciences, University of Tokyo)
Colored HOMFLY homology and super-A-polynomial

14:30–15:20 Rinat Kashaev (Université de Genève)
Edge state integrals on shaped triangulations

15:40– Problem Session

May 24 (Fri)

10:00–10:50 Tetsuya Ito (Research Institute for Mathematical Sciences, Kyoto University)
Quantum representations of braid groups and Garside structure

11:10–12:00 Atsuhiko Mizusawa (Waseda University)
Yokota type invariants derived from Costantino-Murakami's invariants

13:20–14:10 Hiromasa Moriuchi (Osaka City University Advanced Mathematical Institute)
A table of coherent band-Gordian distances between knots

14:30–15:20 Kazuhiro Hikami (Kyushu University)
Cluster algebra and complex volume

Intelligence of Low-dimensional Topology

May 22–24, 2013

RIMS, Kyoto University

Abstract

Sergio Fenley (Florida State University / Princeton University)
Knot theory of R-covered Anosov flows: Homotopy versus isotopy of closed orbits

Twenty years ago I constructed examples of R-covered Anosov flows in hyperbolic closed hyperbolic 3-manifolds. In these examples any closed orbit of the flow is freely homotopic to infinitely many other closed orbits. The natural question from topology is whether these orbits (ie these knots in the manifold) are not only freely homotopic, but also isotopic. That is, do all these orbits represent the same knot in the manifold? In joint work with Thomas Barthelme, we prove that if in addition the stable foliation is transversely orientable, then indeed all freely homotopic closed orbits are in fact isotopic. So they all represent the same knot in the manifold.

Hiroyuki Fuji (Graduate School of Mathematical Sciences, University of Tokyo)
Colored HOMFLY homology and super-A-polynomial

I would like to discuss the properties of the colored HOMFLY homology. In recent years, the connection between the HOMFLY homology and the refined topological string has been studied remarkably, and the colored superpolynomial for various knots became calculable. In collaboration with S. Gukov, M. Stosic, and P. Sulkowski, we observed the existence of a q-difference equation for the colored superpolynomial in the completely symmetric representation, and such equation reduces to the polynomial which is interpreted as the generalization of the A-polynomial. We call this polynomial as "super-A-polynomial" and it describes the asymptotic behavior of the colored superpolynomial. In this talk, I would like to show how the colored HOMFLY homologies are found via some working definitions, and discuss about the generalization of the volume conjecture from some computational results.

Kazuhiro Hikami (Kyushu University)
Cluster algebra and complex volume

We give a cluster algebraic interpretation of complex volume of knots. We construct R operator using mutation of cluster algebra, and explain a correspondence with a hyperbolic ideal tetrahedron. This talk is based on a joint work with Rei Inoue (Chiba Univ).

Ayumu Inoue (Department of Mathematics Education, Aichi University of Education)

On the availability of quandle theory to classifying links up to link-homotopy

The notion of link-homotopy was introduced by John Milnor in 1954. Two links are said to be link-homotopic if they are related to each other by a finite sequence of ambient isotopies and self-crossing changes. The classification problem of links up to link-homotopy was completely solved by Nathan Habegger and Xiao-Song Lin in 1990. They gave an algorithm which determines whether given links are link-homotopic or not. On the other hand, we have no computable numerical or algebraic invariants which completely classify links up to link-homotopy so far. In this talk, we introduce algebraic and numerical link-homotopy invariants obtained from quandle theory. It seems to be quite effective in the classification.

Tetsuya Ito (Research Institute for Mathematical Sciences, Kyoto University)

Quantum representations of braid groups and Garside structure

We show that a version of quantum braid group representation that comes from generic Verma modules nicely behaves with respect to the dual Garside structure. This provides a unified proof of the faithfulness of "generic" quantum representation. In particular, our result shows that quantum braid representations, important ingredients of quantum invariants, have various stimulating combinatorial properties.

Rinat Kashaev (Université de Genève)

Edge state integrals on shaped triangulations

A shaped triangulation is a finite triangulation of an oriented (pseudo) 3-manifold where each tetrahedron carries dihedral angles of an ideal hyperbolic tetrahedron. To each shaped triangulation, we associate a partition function in the form of an absolutely convergent state integral which is invariant with respect to shaped 3-2 Pachner moves and shape gauge transformations generated by total dihedral angles around internal edges through the Neumann-Zagier Poisson bracket. Similarly to Turaev-Viro theory, the state variables live on edges of the triangulation but take their values on the whole real axis. The tetrahedral weight functions enjoy a manifest tetrahedral symmetry. We conjecture that for shaped 1-vertex triangulations of closed 3-manifolds, our partition function is twice the absolute value squared of the partition function of the Teichmüller TQFT defined earlier by Andersen and myself in arXiv:1109.6295. The presentation is based on the joint work with F. Luo and G. Vartanov, arXiv:1210.8393.

Atsuhiko Mizusawa (Waseda University)
Yokota type invariants derived from Costantino-Murakami's invariants

Yokota defined spatial graph invariants through estimations of Kauffman brackets for framed trivalent graphs. In this talk, we define these type invariants from Costantino-Murakami's invariants for oriented framed trivalent graphs. Costantino-Murakami's invariants are defined through the non-integral representation of $U_q(sl2)$ where q is at a root of unity and have a property of the volume conjecture. We also discuss the well-definedness of integral versions of the invariants. This is a joint work with Jun Murakami.

Hiromasa Moriuchi (Osaka City University Advanced Mathematical Institute)
A table of coherent band-Gordian distances between knots

A coherent band surgery is a local move on an oriented link, which is equivalent to a smoothing a crossing. The coherent band-Gordian distance between two links is the least number of coherent band surgeries needed to transform one link into the other. We introduce some criteria for two links which are related by a coherent band surgery. Then we give a table of coherent band-Gordian distances between two knots with up to seven crossings. This is a joint work with Taizo Kanenobu.

Kimihiko Motegi (Nihon University)
Hyperbolic knots with left-orderable, non–L–space surgeries (joint work with Masakazu Teragaito)

A Dehn surgery is said to be *left-orderable* if the resulting manifold of the surgery has the left-orderable fundamental group, and a Dehn surgery is called an *L–space surgery* if the resulting manifold of the surgery is an L–space. We will focus on left-orderable, non–L–space surgeries on knots in the 3–sphere. Once we have a knot with left-orderable surgeries, the "periodic construction" enables us to provide infinitely many knots with left-orderable, non–L–space surgeries. We apply the construction to present infinitely many hyperbolic knots on each of which every nontrivial surgery is a left-orderable, non–L–space surgery.

Masakazu Teragaito (Hiroshima University)
Left-orderable fundamental groups and Dehn surgery on two-bridge knots

We are interested in the problem when the fundamental groups of 3-manifolds admit left-orderings. In this talk, we examine this for 3-manifolds obtained by Dehn surgery on two-bridge knots.

Yuji Terashima (Tokyo Institute of Technology)
Torsions from cluster transformations

The theory of cluster transformations was introduced by S. Fomin and A. Zelevinsky. In this talk, we explain a new method to compute explicitly torsions on a 3-manifolds by using the theory of cluster transformations.