

The 9th KOOK-TAPU Joint Seminar on
Knots and Related Topics &
The 11th Graduate Student Workshop on Mathematics

Osaka City University

July 25–27, 2017

(Arrival: July 24, Departure: July 28)

Organization

Organizers

Taizo Kanenobu (Osaka City University, Japan)

Seiichi Kamada (Osaka City University, Japan) Contact

Yongju Bae (Kyungpook National University, Korea)

Sang Youl Lee (Pusan National University, Korea)

Local Organizers

Akio Kawauchi (Osaka City University Advanced Mathematical Institute, Japan)

Hiroataka Akiyoshi (Osaka City University, Japan)

Hideo Takioka (Osaka City University Advanced Mathematical Institute, Japan)

Seonjeong Park (Osaka City University Advanced Mathematical Institute, Japan)

Masashi Yasumoto (Osaka City University Advanced Mathematical Institute, Japan)

	July 25 (Tue)	July 26 (Wed)	July 27 (Thu)
9:00-9:10	Registration		
9:10-9:15	Opening of KOOK-TAPU		
9:15-9:45	Sang Youl Lee	Young Ho Im	Jieon Kim
9:45-10:15	Celeste Damiani	Kengo Kawamura	Yongju Bae
10:15-10:30	Short Break		Award Ceremony (10:15-10:45)
10:30-11:00	Megumi Harada	Benjamin Bode	Excursion & Free Discussion
11:00-11:30	Mason Pember	Hideo Takioka	
11:30-12:45	Lunch Break		
12:45-13:00	Group Photo & Opening of GSW	Lunch Break	
13:00-14:00	Seonmi Choi Yudai Taishi Geunyoung Kim Masashi Noji	Yusuke Suyama Jongkyu Lee Yongjae Park Hyeran Cho	
14:00-14:15	Short Break		
14:15-15:15	Masahiro Morimoto Minjae Kwon Minju Seo Hun Lee	Takuto Yamamoto Kyongte Kim Kazuya Akagawa Kota Yamane	
15:15-15:45	Break		
15:45-16:45	Dongho Lee Takaya Kumakawa Hiroshi Tsukada Tomoyoshi Nakayama	Byeorhi Kim Sanghoon Park Hiroaki Karuo Suhyeon Jeong	

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Program

July 25th, 2017

9:10-9:15	Opening
Chair	Yongju Bae (Kyungpook National University)
9:15-9:45	Sang Youl Lee (Pusan National University)
	TBA
9:45-10:15	Celeste Damiani (OCAMI, JSPS)
	TBA
10:15-10:30	Short Break
Chair	Jieon Kim (OCAMI)
10:30-11:00	Megumi Harada (McMaster University and Osaka City University)
	Toric degenerations of flag varieties: recent developments
11:00-11:30	Mason Pember (Technische Universität Wien)
	Characterizing singularities of a surface in Lie sphere geometry

July 26th, 2017

Chair	Celeste Damiani (OCAMI)
9:15-9:45	Young Ho Im (Pusan National University)
	TBA
9:45-10:15	Kengo Kawamura (OCAMI)
	On diagrams of immersed 2-knots with one self-intersection point
10:15-10:30	Short Break

Chair	Akio Kawauchi (OCAMI)
10:30-11:00	Benjamin Bode (University of Bristol) On the crossing numbers of composite knots and theta curves
11:00-11:30	Hideo Takioka (OCAMI) Infinitely many knots with the trivial $(2, 1)$ -cable Γ -polynomial

July 27th, 2017

Chair	Sang Youl Lee (Pusan National University)
9:15-9:45	Jieon Kim (OCAMI, JSPS) Biquasile Boltzmann enhancements of oriented surface-links
9:45-10:15	Yongju Bae (Kyungpook National University) On a configuration space of a quandle homology group

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Titles & Abstracts

July 25th, 2017

Title: TBA

Sang Youl Lee (Pusan National University, South Korea)

sangyoul@pusan.ac.kr

Abstract

TBA

Title: TBA

Celeste Damiani (Osaka City University Advanced Mathematical Institute, JSPS, Japan)

celeste@sci.osaka-cu.ac.jp

Abstract

TBA

Title: Toric degenerations of flag varieties: recent developments

Megumi Harada (McMaster University and Osaka City University, Canada and Japan)

Megumi.Harada@math.mcmaster.ca

Abstract

Toric degenerations are a particular types of flat families of algebraic varieties. Flag varieties are a family of algebraic varieties which carry a lot of symmetry and have intimate connections with other areas of mathematics such as representation theory and combinatorics. In this expository talk I will sketch some history of these topics as well as some recent developments.

Title: Channel surfaces in Lie sphere geometry
Mason Pember (Technische Universität Wien, Austria)
mason@geometrie.tuwien.ac.at

Abstract

Channel surfaces are the envelopes of a 1-parameter family of spheres. In this talk we shall study how these surfaces are characterised in Lie sphere geometry. Furthermore, we shall investigate Ribaucour transforms between such surfaces.

July 26th, 2017

Title: TBA
Young Ho Im (Pusan National University, South Korea)
yhim@pusan.ac.kr

Abstract

TBA

Title: On diagrams of immersed 2-knots with one self-intersection point
Kengo Kawamura (Osaka City University Advanced Mathematical Institute, Japan)
kengok@sci.osaka-cu.ac.jp

Abstract

An immersed 2-knot is a 2-sphere generically immersed in 4-space, each of whose self-intersection points is an isolated double point. A diagram of an immersed 2-knot is its generic projection into 3-space, equipped with over/under information. In this talk, we study a diagram of an immersed 2-knot with one self-intersection point.

Title: On the crossing numbers of composite knots and theta curves
Benjamin Bode (University of Bristol, United Kingdom)
benjamin.bode@bristol.ac.uk

Abstract

It is one of the oldest conjectures in knot theory that the minimal crossing number is additive under the connected sum, i.e. $c(K1\#K2) = c(K1) + c(K2)$ for all knots $K1$ and $K2$. While the inequality $c(K1\#K2) \leq c(K1) + c(K2)$ is almost immediate, finding lower bounds for $c(K1\#K2)$ has proven extremely challenging.

In this talk I will point out relations between $c(K1\#K2)$ and the minimal crossing numbers of embedded graphs, in particular theta curves, that could lead to lower bounds for the crossing number $c(K1\#K2)$.

Title: Infinitely many knots with the trivial $(2, 1)$ -cable Γ -polynomial
Hideo Takioka (Osaka City University Advanced Mathematical Institute, Japan)
takioka@sci.osaka-cu.ac.jp

Abstract

For coprime integers $p(> 0)$ and q , the (p, q) -cable Γ -polynomial of a knot is the Γ -polynomial of the (p, q) -cable knot of the knot, where the Γ -polynomial is the common zeroth coefficient polynomial of the HOMFLYPT and Kauffman polynomials. In this talk, we show that there exist infinitely many knots with the trivial $(2, 1)$ -cable Γ -polynomial, that is, the $(2, 1)$ -cable Γ -polynomial of the trivial knot. Moreover, we show that the knots have the trivial Γ -polynomial, the trivial first coefficient HOMFLYPT and Kauffman polynomials and the distinct Conway polynomials.

July 27th, 2017

Title: Biquasile Boltzmann enhancements of oriented surface-links
Jieon Kim (Osaka City University Advanced Mathematical Institute, JSPS, Japan)
jjeonkim@sci.osaka-cu.ac.jp

Abstract

D. Needell and S. Nelson introduced an algebraic structure called a *biquasile*, which is used to define invariants of oriented classical links via their dual graph diagrams. A biquasile is a set with six binary operations satisfying the conditions derived from Reidemeister moves. In this talk, I'd like to introduce a biquasile coloring for marked graph diagrams of oriented surface-links and counting invariants of oriented surface-links. Also, we define a Boltzmann weight for crossings and marked vertices of marked graph diagrams, and biquasile Boltzmann enhancements of oriented surface-links. This is a joint work with S. Nelson.

Title: On a configuration space of a quandle homology group
Yongju Bae (Kyungpook National University, South Korea)
ybae@knu.ac.kr

Abstract

The quandle homology group is defined by using the algebraic structure. In this talk, we will introduce a CW-complex, corresponding to a quandle Q , whose homology group coincides the quandle homology group of Q .

The 11th Graduate Student Workshop on Mathematics

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Program

July 25th, 2017

Chair	Hideo Takioka (OCAMI)
13:00-13:15	Seonmi Choi (Kyungpook National University) On a rational type of a surface-tangle
13:15-13:30	Yudai Taishi (Osaka City University) Linear bikeis
13:30-13:45	Geunyoung Kim (Pusan National University) TBA
13:45-14:00	Masashi Noji (Osaka City University) Young tableaux and the Robinson-Schensted-Knuth correspondence
14:00-14:15	Short Break
Chair	Chan-Young Park (Kyungpook National University)
14:15-14:30	Masahiro Morimoto (Osaka City University) Elliptic operators and Compact Groups
14:30-14:45	Minjae Kwon (Kyungpook National University) The Krull dimension of composite power series rings over valuation rings
14:45-15:00	Minju Seo (Pusan National University) TBA
15:00-15:15	Hun Lee (Kyungpook National University) On the colorability of $(1, 1)$ -tangles
15:15-15:45	Break

Chair	Masashi Yasumoto (OCAMI)
15:45-16:00	Dongho Lee (Kyungpook National University) A theoretical study on mathematical modelling of MERS-CoV transmission with application of optimal control
16:00-16:15	Takaya Kumakawa (Osaka City University) Existence and uniqueness theorem on SDEs
16:15-16:30	Hiroshi Tsukada (Osaka City University) On local times for Lévy processes
16:30-16:45	Tomoyoshi Nakayama (Osaka City University) TBA

July 26th, 2017

Chair	Seonjeong Park (OCAMI)
13:00-13:15	Yusuke Suyama (Osaka City University) Toric Fano varieties associated to building sets
13:15-13:30	Jongkyu Lee (Pusan National University) TBA
13:30-13:45	Yongjae Park (Kyungpook National University) On polynomial invariants of links of Kanenobu type
13:45-14:00	Hyeran Cho (Pusan National University) TBA

14:00-14:15 **Short Break**

Chair	Hiroataka Akiyoshi (Osaka City University)
14:15-14:30	Takuto Yamamoto (Osaka City University) Existence of solutions to Schrödinger equation for Random final-data
14:30-14:45	Kyongte Kim (Osaka City University) The maximum principle
14:45-15:00	Kazuya Akagawa (Osaka City University) The relationship between the Radon-Nikodym derivative and the derivative of complex measures
15:00-15:15	Kouta Yamane (Osaka City University) Existence of weak solutions for elliptic equations via Lax-Milgram Theorem
15:15-15:45	Break

Chair	Young Ho Im (Pusan National University)
15:45-16:00	Byeorhi Kim (Kyungpook National University) On decomposed quandles as 2-cocycle abelian extensions
16:00-16:15	Sanghoon Park (Pusan National University) TBA
16:15-16:30	Hiroaki Karuo (RIMS, Kyoto University) Introduction to quantum invariants of knots
16:30-16:45	Suhyeon Jeong (Pusan National University) TBA

July 27th, 2017

10:15-10:45	Award Ceremony for The 11th Graduate Student Workshop
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Titles & Abstracts

July 25th, 2017

Title: On a rational type of a surface-tangle
Seonmi Choi (Kyungpook National University)
csm123c@gmail.com

Abstract

In 1990, Viro introduced 2-dimensional braidings, called surface braids. Satoh introduced surface-tangles as a generalization of classical tangles and showed that any surface-link can be represented as the closure of a surface-tangle. In this talk, I will introduce a rational type of a surface-tangle defined as similar to surface braids via classical rational tangles and we will study some properties related to the closure of a rational type of a surface-tangle.

Title: Linear bikeis
Yudai Taishi (Osaka City University)
m16sab0t18@st.osaka-cu.ac.jp

Abstract

A bikei is a set with two binary operations satisfying certain conditions. The conditions correspond to Reidemeister moves in knot theory. In this talk, we consider linear bikeis over Z_p .

Title: TBA
Geunyoung Kim (Pusan National University)
rms246@pusan.ac.kr

Abstract

TBA

Title: Young tableaux and the Robinson-Schensted-Knuth correspondence

Masashi Noji (Osaka City University)

mathlibrary0824@gmail.com

Abstract

The row bumping is the algorithm that is defined for Young tableaux. By this algorithm, we can get a one to one correspondence between matrices with nonnegative integer entries (or two rowed arrays) and pairs of tableaux of the same shape, known as the Robinson-Schensted-Knuth correspondence. In this talk, I introduce how to construct the R-S-K correspondence.

Title: Elliptic operators and compact groups

Masahiro Morimoto (Osaka City University)

mzasahiro0408@gmail.com

Abstract

Let G be a compact Lie group. A G -invariant differential operator on a compact G -manifold is said to be transversally elliptic if it is elliptic in the directions transversal to the G -orbits. In this talk, we first review the spectral properties of an elliptic operator. After that, we study the spectral properties of a transversally elliptic operator and compare them.

Title: The Krull dimension of composite power series rings over valuation rings

Minjae Kwon (Kyungpook National University)

know1122@naver.com

Abstract

In this talk, a ring R is always a commutative ring with identity. I introduce the history of the problem of determining the Krull dimension of polynomial rings and power series rings. We denote $\dim(R)$ as the Krull dimension of R . When $\dim(R)$ is finite, $\dim(R[X])$ was completely determined. In power series case, there are some differences. For example, the Krull dimension of $R[[X]]$ may have uncountable even if $\dim(R) = 1$. After I introduce a concept for amalgamation which is a special case of pull back, I deal with some special construction of a amalgamation and observe it. Near the end of the presentation, I introduce the main results and some unsolved problems.

Title: TBA

Minju Seo (Pusan National University)

tjalswn92@naver.com

Abstract

TBA

Title: On the colorability of $(1, 1)$ -tangles
Hun Lee (Kyungpook National University)
hunny0640@naver.com

Abstract

When a link diagram D is colored by a quandle, it is clear that the $(1, 1)$ -tangle T obtained by cutting an edge of D is colorable by the quandle. In this talk, we will study whether the colorability of T implies the colorability of D .

Title: A theoretical study on mathematical modelling of MERS-CoV transmission with application of optimal control
Dongho Lee (Kyungpook National University)
ldh-0625@hanmail.net

Abstract

In this talk, we propose and analyze a MERS-CoV epidemic problem. Using a SIR model, the basic reproduction number is obtained. Moreover, we consider two time-dependent control measures and obtain the optimal control strategy to minimize both the infected populations and the associated costs. All the analytical results are verified by simulation works.

Title: Existence and uniqueness theorem on SDEs
Takaya Kumakawa (Osaka City University)
m17sa012@ty.osaka-cu.ac.jp

Abstract

Stochastic differential equations (SDEs) are ordinary differential equations with noise terms. The main topics in this talk is the theorem on the existence and uniqueness of the solution. Some typical examples will be introduced.

Title: On local times for Lévy processes
Hiroshi Tsukada (Osaka City University)
d15sac0p04@st.osaka-cu.ac.jp

Abstract

The local time for a stochastic process is a family of random variables that characterize the amount of time spent by the process at a given point. In this talk, we shall establish the Tanaka formula for Lévy processes from view point of the Doob-Meyer decomposition for local times.

Title: TBA

Tomoyoshi Nakayama (Osaka City University)

tomoyoshi.3215@gmail.com

Abstract

TBA

July 26th, 2017

Title: Toric Fano varieties associated to building sets

Yusuke Suyama (Osaka City University)

d15san0w03@st.osaka-cu.ac.jp

Abstract

We give a necessary and sufficient condition for the nonsingular projective toric variety associated to a building set to be Fano or weak Fano in terms of the building set.

Title: TBA

Jongkyu Lee (Pusan National University)

blessedlad@pusan.ac.kr

Abstract

TBA

Title: On polynomial invariants of links of Kanenobu type

Yongjae Park (Kyungpook National University)

yongff@naver.com

Abstract

In 1986, T. Kanenobu defined a family of knots $K_{p,q}$, called Kanenobu knots, where p and q are the number of full twists. In 2005, L. Watson introduced a generalization of Kanenobu knots. In this talk, we will introduce a family of links $L_b(T, U)$ which is modified by L. Watson's generalization and a family of links $L_b(T, U)$ is obtained from \mathbb{Z} -action. We give some relations of Jones polynomial and HOMFLY-PT polynomial of $L_b(T, U)$ and $L_{b^n}(T, U)$.

Title: TBA
Hyeran Cho (Pusan National University)
Hyeran131@naver.com
Abstract

TBA

Title: Existence of solutions to Schrödinger equation for Random final-data
Takuto Yamamoto (Osaka City University)
takuto.yamamoto.4525@gmail.com
Abstract

It is known that it exists the solutions to power-type nonlinear Schrödinger equations (NLS) under some assumption. In this talk, I would like to talk on the randomization of final-data and the existence of unique solution of NLS.

Title: The maximum principle
Kyongte Kim (Osaka City University)
kimkyongte@gmail.com
Abstract

Maximum principle concerns a basic property of solutions to partial differential equations. In this talk, I introduce several maximum principles.

Title: The relationship between the Radon-Nikodym derivative and the derivative of complex measures
Kazuya Akagawa (Osaka City University)
kazuya4876@gmail.com
Abstract

The complex measure which satisfies appropriate conditions is represented uniquely by the Lebesgue integral. In this talk, we show that the derivative of a complex measure is related to its integral representation.

Title: Existence of weak solutions for elliptic equations via Lax-Milgram Theorem

Kouta Yamane (Osaka City University)

1220.kouta@gmail.com

Abstract

The Lax-Milgram Theorem is a powerful tool to show the existence of weak solutions of elliptic equations. In this talk, I introduce typical applications of Lax-Milgram Theorem to PDE Theory.

Title: On decomposed quandles as 2-cocycle abelian extensions

Byeorhi Kim (Kyungpook National University)

kbrdooly@naver.com

Abstract

In 2003, J. S. Carter, M. Elhamdadi and M. Saito introduced an abelian extension of a quandle by using cocycle. In my previous work, I studied sufficient conditions for operation tables which have decomposed structure to be quandles and it is motivated from the paper in 2006 of S. Nelson, C. -Y. Wong and the paper in 2008 of G. Ehrman, A. Gurpinar, M. Thibault and D. N. Yetter. In this talk, I explain the decomposed structure of quandle operations as abelian extension using 2-cocycle.

Title: TBA

Sanghoon Park (Pusan National University)

sanghoon1204@naver.com

Abstract

TBA

Title: Introduction to quantum invariants of knots

Hiroaki Karuo (RIMS, Kyoto University)

karu@kurims.kyoto-u.ac.jp

Abstract

In 1980s, many invariants of knots, called “quantum invariants”, were discovered. These invariants are constructed systematically by using quantum groups and their representations. These invariants can be unified by “universal invariants” whose values belong to quantum groups. In this talk, I will introduce these invariants.

Title: TBA

Suhyeon Jeong (Pusan National University)

j00399501303@pusan.ac.kr

Abstract

TBA