Topology and Geometry of Low-dimensional Manifolds

October 18 (Mon) - October 19 (Tue), 2022

Face-to-face

Schedule

JST	17 (Mon)	18 (Tue)
10:00-11:00	Maruyama	Vera
11:30-12:30	Sakuma	Karuo
14:30-15:30	Katada	
16:00-17:00	Vespa	

Abstract

Hiroaki Karuo (Gakushuin University)

Title. LRY skein algebras and Chekhov–Fock algebras

Abstract. Quantum trace maps help us understand a relation between skein algebras and quantum Teichmüller spaces. For a surface with an ideal triangulation, by splitting the surface along the edges, one can construct a quantum trace map of Lê's stated skein algebra of the surface. However, in the case of Roger–Yang skein algebras, the construction has an unavoidable problem and does not work. In the talk, we introduce Lê–Roger–Yang skein algebras by combining Lê's stated ones and Roger–Yang ones and construct quantum trace maps for them with specific ideal triangulations. As a result, we can embed "reduced" LRY skein algebras into Chekhov–Fock algebras, where Chekhov–Fock algebras are algebraic objects to construct a quantum Teichmüller space. This is a joint work with W. Bloomquist and Thang T. Q. Lê (Georgia Tech).

Mai Katada (Kyoto University)

Title. Stable rational homology of the IA-automorphism groups of free groups

Abstract. The IA-automorphism group IAn of the free group Fn is a normal subgroup of the automorphism group $\mathrm{Aut}(Fn)$ of Fn, which is an analogue of the Torelli groups of surfaces with one boundary component. Little is known about the rational homology of IAn except for the first and second homology. We consider the image of the induced map by the abelianization map of IAn on homology. We call it the Albanese homology of IAn. The Albanese homology of IAn is a subgroup of the rational homology of the abelianization of IAn, which is an algebraic $\mathrm{GL}(n,\mathbb{Q})$-representation. The Albanese homology of IAn in

degree greater than 2 has not been determined. In this talk, we determine the stable third Albanese homology of IAn, and in each degree, we obtain a subquotient of the Albanese homology of IAn in a stable range, which is conjecturally equal to the entire Albanese homology of IAn. We also propose conjectural stable structures of the Albanese homology of the analogue of IAn to the outer automorphism groups, and the Albanese homology of the Torelli groups of surfaces. Moreover, we study the relation between the Albanese homology of IAn and twisted cohomology of Aut(Fn).

Shuhei Maruyama (Nagoya University)

Title. The space of non-extendable quasimorphisms

Abstract. A quasimorphism is a real-valued function on a group which is "a homomorphism up to bounded error". In this talk, we discuss the extension problem of invariant homogeneous quasimorphisms for groups with geometric flavors, such as free groups, surface groups, hyperbolic 3-manifold groups, and automorphism groups of free groups. Moreover, we explain a relation between non-extendable quasimorphisms and taut foliations on a hyperbolic 3-manifold that fibers over the circle. This is joint work with Morimichi Kawasaki, Mitsuaki Kimura, Takahiro Matsushita, and Masato Mimura.

Makoto Sakuma (Osaka Metropolitan University)

Title. Checkerboard surface subgroups of alternating link groups from the view point of non-positively curved cubings

Abstract. It has been proved by Aitchison and others that the exterior of a prime alternating link admits a non-positively curved cubical decomposition, in which the checkerboard surfaces are totally geodesic. This structure was used by Agol in the classification of the parabolic generating pairs of hyperbolic 2-bridge link groups. In this talk, I will first explain our interpretation of his arguments and then talk about application of the non-positively curved cubings to the study of subgroups of alternating link groups that arise as intersections of conjugates of checkerboard surface fundamental groups. This is a joint work with Shunsuke Sakai.

Anderson Vera (Pohang University of Science and Technology)

Title. Double lower central series and a double Johnson filtration for the Goeritz group of the sphere

Abstract. For a triple (K, X, Y) consisting of a group K and two normal subgroups X and Y of K, we introduce a double-indexed family of normal subgroups of K which we call the double lower central series. In particular, if $K = XY$ we show that this family allows us to recover the lower central series of K. If G is a group acting on K preserving X and Y, we show that the double lower central series induces a double-indexed filtration of G. We apply this theory to the group of isotopy classes of self-homeomorphisms of the 3-sphere S^3 which preserves the standard decomposition of S^3 as the gluing of two handlebodies. (Joint work with Kazuo Habiro.)

Christine Vespa (Aix-Marseille Université)

Title. Polynomial functors associated with beaded open Jacobi diagrams

Abstract. The Kontsevich integral is a very powerful invariant of knots, taking values is the space of Jacobi diagrams. Using an extension of the Kontsevich integral to tangles in handlebodies, Habiro and Massuyeau construct a functor from the category of bottom tangles in handlebodies to the linear category A of Jacobi diagrams in handlebodies. The category A has a subcategory equivalent to the linearization of the opposite of the category of finitely generated free groups, denoted by $\mathbf{gr}^{op}$. By restriction to this subcategory, morphisms in the linear category A give rise to interesting contravariant functors on the category $\mathbf{gr}$, encoding part of the composition structure of the category A. In recent papers, Katada studies the functor given by the morphisms in the category A from 0. In particular, she obtains a family of polynomial functors on $\mathbf{gr}^{op}$ which are *outer functors*, in the sense that inner automorphisms act trivially. In this talk, I will explain these results and give extensions of Katada's results concerning the functors given by the morphisms in the category A from any integer k. These functors give rise to families of polynomial functors on $\mathbf{gr}^{op}$ which are no more outer functors. Our approach is based on an equivalence of categories given by Powell. Through this equivalence the previous polynomial functors correspond to functors given by beaded open Jacobi diagrams.