Two decompositions of the Milnor fiber

Norbert A'Campo

From an embedded resolution we obtain for the local smooth fiber of a complex hypersurface singularity a decomposition in compact disjoint sets. The decomposition is invariant by the geometric monodromy. The action of the monodromy on a subset is a cyclic permutation or a cyclic root of a translation on a torus. From this decomposition one can compute topological and dynamical invariants such as eigenvalues and entropy. On the other hand, by using the symplectic structure on the ambiant complex numerical space, we obtain a two dimensional foliation on the fiber, a little singular but invariant by the monodromy. The complex structure of the fiber is determined by its restriction to the foliation. The variation by the action of the monodromy of the complex structure in the leaves is uniform in two senses: independent of the leaf and independent of the singularity.

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Quantum Gelfand Pairs

Kürsat Aker

The inclusions (S(n+ 1); S(n)) and (S(n+m); S(m)x S(n)) are two well known examples of Gelfand pairs. The notion of a Gelfand pair for compact quantum groups was introduced by Koornwinder in 1991 and connections to q-special functions and representation theory were investigated by Koornwinder, Vainerman, and Floris, among other authors. In this paper, we investigate the quantized versions of the symmetric groups, the so called Quantum permutation groups of Wang and show that they yield Quantum Gelfand pairs in analogy to the classical examples.

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Bernoulli series and volumes of moduli spaces

Arzu Boysal

Using Szenes formula for multiple Bernoulli series, we explain how to compute Witten series associated to classical Lie algebras. Particular instances of these series compute volumes of moduli spaces of flat bundles over surfaces, and multiple zeta values.

This is joint work with Velleda Baldoni and Michèle Vergne.

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On The Self Intersection of Relative Dualizing Sheaf

Zübeyir Çınkır

When we consider a semistable fibration $f : X \longrightarrow Y$ where X is a projective smooth surface over a field k and Y is a projective smooth curve over k, we have an associated relative dualizing sheaf $\omega_{X/Y}$. The desired upper and lower bounds to the self intersection $\omega_{X/Y}^2$ of this sheaf have important applications in arithmetic of curves.

In this talk, we first give an overview of what we know about $\omega_{X/Y}^2$. Then we mention the related conjectures and their implications.

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Lines generate the Picard group of a Fermat surface

Alex Degtyarev

We answer a question of T. Shioda and show that, for any positive integer m prime to 6, the Picard group of the Fermat surface Φ_m is generated by the classes of lines contained in Φ_m. More generally, for any m, the classes of lines span a primitive subgroup of $\operatorname{Pic}\Phi_m$. These results admit an even further generalization (although not quite straightforward) to Delsarte surfaces.

The proof revolves about the topology of abelian coverings and the concept of Alexander module of a plane curve.

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Abundance of real lines on real algebraic hypersurfaces

Sergey Finashin

In a joint work with V. Kharlamov, we gave an estimate for the numbers of lines on real algebraic n-dimensional hypersurfaces of degree $(2n-1)$ using evaluation of a certain signed count of these lines. The signs involved can be viewed as a generalized version of the Welschinger indices. "Abundance" in the title of the talk refers to the asymptotic logarithmic proportionality of the numbers of the projective subspaces over $\mathbf{R}$ and over $\mathbf{C}$.

Our approach allows also a generalization to obtain a similar kind of estimates for the numbers of projective subspaces on real algebraic hypersurfaces (of certain dimensions and degrees).

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Four groups related to associators

Hidekazu Furusho

I first will recall Drinfeld's definition of associators and explain my (and its related) results. Then I will explain the four pro-unipotent algebraic groups related to associators; the motivic Galois group, the Grothendieck-Teichmuller group, the double shue group and the Kashiwara-Vergne group. Relationships, actually inclusions, between them will be discussed.

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Toward a generalization of the theory of Artin groups

Tadashi Ishibe

For a finite reflection group W, we consider the fundamental group of regular orbit space of the finite reflection group W. The fundamental group admits a special presentation whose defining relations correspond to the finite Coxeter diagram of type W. The group (resp. monoid) defined by that presentation is called an Artin group (resp. Artin monoid). By showing a certain lemma for Artin monoid, we conclude that Artin monoid is a cancellative monoid and the LCM condition(i.e. for any two elements α, β, there exist left and right least common multiples of them) is satisfied. As a result, some decision problems in Artin groups can be solved. We may say that the above lemma is a key to success in the theory of Artin groups. In the talk, emphasizing the role of the lemma, we will consider a generalization of the theory of Artin groups.

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Geometric completion for deformation spaces of Kleinian groups

Ken'ichi Ohshika

We consider a new kind of completion for deformation spaces of Kleinian groups with respect to the geometric topology. We shall show the phenomenon of bumping, which occurs in the algebraic topology, disappears in this completion. We shall also show that the mapping class group acts naturally on the geometric completion of a Bers slice, in contrast to its algebraic compactificaton on which the mapping class group cannot act.

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On the fundamental groups of non-generic $\mathbb{R}$-join-type curves

Mutsuo Oka

An $\mathbb{R}$-*join-type curve* is a curve in $\mathbb{C}^2$ defined by an equation of the form

$$a \cdot \prod_{j=1}^{\ell} (y - \beta_j)^{\nu_j} = b \cdot \prod_{i=1}^{m} (x - \alpha_i)^{\lambda_i},$$

where the coefficients a, b, α_i and β_j are *real* numbers. For generic values of a and b, the singular locus of the curve consists of the points (α_i, β_j) with $\lambda_i, \nu_j \geq 2$ (so-called *inner* singularities). In the non-generic case, the inner singularities are not the only ones: the curve may also have *'outer'* singularities. The fundamental groups of (the complements of) curves having only inner singularities are considered in [**?**]. In the present paper, we investigate the fundamental groups of a special class of curves possessing outer singularities.

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Symplectic fillings of lens spaces and rational blowdowns

Burak Ozbağcı

We construct a positive allowable Lefschetz fibration over the disk on any minimal (weak) symplectic filling of the canonical contact structure on a lens space. Using this construction we prove that any minimal symplectic filling of the canonical contact structure on a lens space is obtained by a sequence of rational blowdowns from the minimal resolution of the corresponding complex two-dimensional cyclic quotient singularity. This is a joint work with Mohan Bhupal.

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Thom polynomials in the basis of Schur Functions

Özer Öztürk

After recalling basics about Thom polynomials and Schur functions, we shall compute Schur function expansions of some Thom polynomials of singularity classes of maps. Then we shall discuss what is known (and not known) about the structure of Schur function expansions of Thom polynomials.

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Free divisors and differential equations

Jiro Sekiguchi

Let $F(x_1, x_2, x_3)$ be a polynomial such that $F = 0$ defines a free divisor. Moreover assume that F is a cubic polynomial with respect to x_3. We construct holonomic systems of differential equation with singularitiea along $F = 0$ and discuss relationship between such holonomic systems and algebric solutions of Painlevé VI equation.

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Non-abelian Higher Dimensional Local Class Field Theory

Erol Serbest

The higher dimensional generalization of Fontaine-Wintenberger's theory of fields of norms is developed by Abrashkin and Scholl. In this talk, using this theory, we shall summarize the generalization of higher dimensional local class field theory of Kato and Parshin to certain non-abelian Galois extensions of an n-dimensional local field of mixed characteristic. This is a joint work with K.İ. İkeda.

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Toward a generalization of the theory of Artin groups

Tadashi Ishibe

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The freeness of ideal subarrangements of Weyl arrangements

Hiroaki Terao

The exponents of an irreducible root system (or of a Weyl arrangement), which are the most important integers arising from the root system, control the corresponding Lie group, the reflection group, and the arrangement of hyperplanes. The celebrated SSKM formula, due to A. Shapiro, R. Steinbrg, B. Kostant and I. G. Macdonald, connects the exponents to the height distribution of positive roots by the concept of dual partitions. The SSKM formula was first proved (without using the classification) by Kostant by studying 3-dimensional Lie subgroups. On the other hand, E. Sommers - J. Tymoczko (2006) conjectured that any ideal subarrangement of the Weyl arrangement is a free arrangement and that the exponents and the height distribution are dual partitions to each other. In this talk, we will prove that the Sommers-Tymoczko conjecture holds true. Our proof, even in the case of the entire Weyl arrangement, gives a new proof of the SSKM formula. (jointly with Takuro AbeCMohamed Barakat, Michael Cuntz, Torsten Hoge)

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Geometric intersection of curves on punctured disks

S. Öykü Yurttaş

In this talk I will introduce a formula which gives the geometric intersection number of an integral laminatination with a "relaxed integral lamination" on an n-times punctured disk D_n. The formula joint with an algorithm of Dynnikov and Wiest provides a way to compute the geometric intersection number of two arbitrary integral laminations on D_n.

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Polygonal decompositions, ball quotients and Belyĭ maps

Ayberk Zeytin

In this talk, we will try to explain some connections between polygonal decompositions of surfaces and ball quotients. Precisely, give a complete description of non-negatively curved triangulations and quadrangulations of surfaces. Then we discuss some arithmetic consequences of the results obtained.

(joint work with M. Uludağ)

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