İZMİR
ALGEBRAIC GEOMETRIC TOPOLOGY
DAYS II

Program & Abstracts

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09 – 14 January 2011
İzmir

Dokuz Eylül University, Faculty of Sciences
Department of Mathematics

IAGT 2011 Program – İzmir Algebraic Geometric Topology Days II, 09 – 14 January 2011

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
09:00 – 10:00	Registration	B. Özbağcı	S. Sertöz	D. Chéniot	K. Andersen	M. Bökstedt
10:00 – 10:20		☕	☕	☕	☕	☕
10:20 – 11:20		Ç. Kutluhan	A. Degtyarev	D. Chéniot	K. Andersen	M. Bökstedt
11:20 – 11:40		☕	☕	☕	☕	☕
11:40 – 12:40	B. Akyar	Ç. Kutluhan	M. Uludağ	A. Altıntaş	Ö. Ünlü	S. Pamuk
12:40 – 14:00	LUNCH					
14:00 – 15:00	C. C. Sarıoğlu	Ç. Karakurt	D. Chéniot	Free afternoon	N. Salepci	M. Şahin
15:00 – 15:20	☕	☕	☕		☕	☕
15:20 – 16:20	K. Gürbžer / S. Baştürk	M. Bhupal	M. Pamuk		N. Salepci	P. Mete
16:20 – 16:30	F. Karaoğlu / Y. Polat	☕	☕		☕	☕
16:30 – 17:00		Cocktail	A. Zeytin		İ Ünal	S. Odabaşı
					Conf. Dinner	

Title of Talks

Bedia Akyar Møller (Dokuz Eylül University)
Variation with prismatic currents

Ayşe Altıntaş (University of Warwick & Yıldız Technical University)
Presentation of multiple point spaces for corank 1 finite map-germs from n-space to $(n+1)$-space

Kasper K. S. Andersen (Aarhus University)
- An introduction to fusion systems
- Searching for exotic fusion systems

Saliha Başẗurk (Dokuz Eylül University)
On Morse theory and intersection homology

Mohan Bhupal (Middle East Technical University)
Milnor open books of links of some rational surface singularities

Marcel Bökstedt (Aarhus University)
On spaces of manifolds

Denis Chéniot (Universite dé Provence)
Stratifications

Alexander Degtyarev (Bilkent University)
Braid monodromy and Hurwitz equivalence

Sabri Kaan Gürbüzer (Dokuz Eylül University)
Associahedron and its various truncation

Çağrı Karakurt (University of Texas, Austin)
Knot Floer homology and contact surgeries

Fatma Karaoğlu (Balıkesir University)
Hilbert functions of one-dimensional Cohen-Macaulay local rings

Çağatay Kutluhan (Columbia University)
Heegaard Floer meets Seiberg–Witten

Pınar Mete (Balıkesir University)
Minimal free resolutions of some Gorenstein monomial curves

Mehmetcik Pamuk (Middle East Technical University)
Full Lutz twist along the binding of an open book

Semra Pamuk (Middle East Technical University)
Equivariant CW-complexes and the orbit category

Sinem Odabaşı (Dokuz Eylül University)
Kaplansky's theorem for vector bundles

Burak Özbağcı (Koç University)
Milnor fillable contact structures are universally tight

Yasemin Polat (Balıkesir University)
Hilbert functions and minimal free resolutions of monomial curves

Nermin Salepci (Université de Strasbourg)
On real open book decompositions

Celal Cem Sarıoğlu (Dokuz Eylül University)
Quadric-line arrangements and ball quotient orbifolds

Sinan Sertöz (Bilkent University)
Counting lines on a $K3$ surface

Mesut Şahin (Çankırı Karatekin University)
Hilbert basis of the Lİpman semigroup

A. Muhammed Uludağ (Galatasaray University)
Higher mapping class groupoids

İbrahim Ünal (Middle East Technical University, Northern Cyprus)
Topology of Phi-free submanifolds

Özgün Ünlü (Bilkent University)
Fusion systems and constructing free actions on products of spheres

Ayberk Zeytin (Middle East Technical University)
Parametrising arithmetic curves

Variation with prismatic currents

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ABSTRACT

We define prismatic currents, that is, currents defined on prismatic sets. We give the simplicial de Rham theory for this construction. Moreover we give the variation of the Chern-Simons class for a given connection in a bundle over a simplicial set.

References

[1] B. Akyar, *Construction of Bundles on Simplicial Sets and Transition functions*, AJSE, 2011.

[2] B. Akyar and J. L. Dupont, *Lattice Gauge Field Theory and Prismatic Sets*, Math. Scand., 1st issue, vol. 108, (2011).

[3] J. L. Dupont, *A dual simplicial de Rham complex, Algebraic Topology-Rational Homotopy*, Proceedings Louvain-la-Neuve 1986, Lecture Notes in Mathematics 1318, Springer-Verlag, Berlin Heidelberg, 1988, pp. 87-91.

[4] J. L. Dupont, *Simplicial de Rham cohomology and characteristic classes of flat bundles*, Topology 15 (1976), 233-245.

[5] J. L. Dupont and H. Just, *Simplicial Currents*, Illinois J. Math. 41, No. 3 (1997), 354-377.

[6] J. L. Dupont and R. Ljungmann, *Integration of simplicial forms and Deligne Cohomology*, Math. Scand. 97 (2005), 11-39.

[7] F. Treves, *Topological Vector Spaces , Distributions and Kernels*, Academic Press, Inc., New York, 1967.J.

Presentation of multiple point spaces for corank 1 finite map-germs from n-space to $(n+1)$-space

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ABSTRACT

The k-th multiple point space D^k of a finite holomorphic map-germ $f : (\mathbb{C}^n, 0) \to (\mathbb{C}^n, 0)$ is the closure of the set of k-tuple points having the same image under f and distinct components. In this talk, we will present the following results. For $p = n + 1$, the projection of the double point space into the domain coincides with the support of the kernel of the multiplication map $m : \mathcal{O}_{\mathbb{C}^n,0} \otimes_{\mathcal{O}_{\mathbb{C}^{n+1},0}} \mathcal{O}_{\mathbb{C}^n,0} \to \mathcal{O}_{\mathbb{C}^n,0}$, $m(a \otimes b) = ab$.

In the case of finitely determined corank 1 map-germs, a resolution of $\mathcal{O}_{D^k}$ over $\mathcal{O}_{D^{k-1}}$ is given by a certain submatrix of the matrix presenting $\mathcal{O}_{\mathbb{C}^n,0}$ over $\mathcal{O}_{\mathbb{C}^{n+1},0}$. This property combined with the result of [2] gives us new examples of free divisors. We will finish by showing that the Noether different of $\mathcal{O}_{\mathbb{C}^n,0}$, considered as an $\mathcal{O}_{\mathbb{C}^p,0}$-algebra via a finite map-germ, coincides with Jacobian and Dedekind different of the same algebra (for definitions, see [1]).

References

[1] E. Kunz, *Kähler differentials*. Advanced Lectures in Mathematics. Friedr. Vieveg & Sohn, Braunschewig, 1986.

[2] D. Mond and M. Schulze, *Adjoint divisors and free divisors*, arXiv:1001.1095v3

An introduction to fusion systems
&
Searching for exotic fusion systems

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ABSTRACT

"Fusion" is a central notion in the theory of finite groups. The term was introduced by R. Brauer in the 1950s but has been of interest for much longer. The proper axiomatic setup for the study of fusion systems was constructed by L. Puig in the early 1990s as a tool in modular representation theory. Later fusion systems were made popular in homotopy theory by works of C. Broto, R. Levi and B. Oliver. In recent years local group theorists like M. Aschbacher have also become seriously interested in fusion systems.

The first talk will give an introduction to this very active subject. In the second talk will describe the results of a systematic search for new exotic fusion systems over "small" 2-groups. This is joint work in progress with B. Oliver and J. Ventura.

References

[1] K. K. S. Andersen, B. Oliver and J. Ventura, *Reduced, tame and exotic fusion systems*, http://arxiv.org/pdf/1009.0622v1

[2] A. Ruiz, *Exotic normal fusion subsystems of general linear groups*, J. London Math. Soc. **76** (2007), 181–196.

[3] B. Oliver and J. Ventura, *Saturated fusion systems over 2-groups*, Trans. Amer. Math. Soc. 361 (2009), 6661–6728.

[4] C. Broto, R. Levi, and B. Oliver, *The homotopy theory of fusion systems*, J. Amer. Math. Soc. 16 (2003), 779–856.

On Morse theory and intersection homology

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ABSTRACT

In this work firstly we give the fundamental information about Morse Theory. After that we explain the intersection homology groups and intersection product. Finally, we aim to give the relation between the Morse theory and intersection homology.

References

[1] M. Goresky and R. MacPherson, *Intersection homology theory*, Topology 19 (1980), 135-162.

[2] M. Goresky and R. MacPherson, *Stratified Morse theory*, Singularities, Pro- ceedings of Symposia in Pure Mathematics 49, American Math. Soc., 517-535, 1983.

[3] M. Goresky and R. MacPherson, *Morse theory and intersection homology*, Astérisque (1983) 101-102, 135-192.

[4] M. Goresky and R. MacPherson, *Intersection homology II*, Inventiones Mathematicae 71 (1983), 77-129.

[5] F. Kirwan, *An introduction to intersection homology theory*, Longman Scientific & Technical, 1988.

[6] J. P. Brasselet, *Intersection of algebraic cycles*, Journal of Mathematical Sciences, 1996.

[7] Y. Matsumoto, *An introduction to Morse theory*, American Mathematical Society, 1997.

Milnor open books of links of some rational surface singularities

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ABSTRACT

In this talk, I will determine Legendrian surgery diagrams for the canonical contact structures of links of rational surface singularities that are also small Seifert fibred 3-manifolds.

This is joint work with Burak Ozbagci.

References

[1] M. Bhupal and B. Özbagcı, *Milnor open books of links of some rational surface singularities*, arXiv:0912.4275

On spaces of manifolds

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ABSTRACT

This is joint work with Ib Madsen. It is related to the topological proof by Madsen and Weiss of the Mumford conjecture. I will give an introduction to the field and an more specialized talk.

References

[1] I. Madsen and M. Weiss, *he stable moduli space of Riemann surfaces: Mumford's conjecture*, nn. of Math. 165 (2007), 843–941.

[2] I. Madsen and M. Weiss, *The Stable Mapping Class Group and Stable Homotopy Theory*, Proc. European Congress of Mathematicians, Stockholm, 2004, 283-307.

Stratifications

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ABSTRACT

Stratifications consist of decompositions of singular objects into smooth pieces called strata. They allow to generalise theorems known for the smooth case to the singular case, such as transversality properties, isotopy lemmas, and Morse theory.

To this effect, the strata must fulfil some regularity conditions relative to each other. We shall deal with frontier and dimension conditions, Whitney's (a) and (b) conditions, Thom's (a_f) condition.

We shall then look at existence theorems for stratifications in various settings, transversality properties, stratifications and flows, local topological triviality and the first and second isotopy theorems of Thom-Mather.

We shall end by examining more deeply the complex analytic case: the behaviour by generic plane sections and condition (b^*), the equivalence between condition (b) and the equimultiplicity of polar varieties.

References

[1] Tzee-Char Kuo, *On Thom-Whitney stratification theory*, Mathematische Annalen, Volume 234, Number 2 (1978) 97-107.

[2] J. Mather, *John Notes on topological stability*, Harvard, 1970.

[3] R. Thom, *Ensembles et morphismes stratifiés*, Bulletin of the American Mathematical Society Vol. 75, 240-284, 1969.

Braid monodromy and Hurwitz equivalence

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ABSTRACT

I will start with an introduction to the concept of braid monodromy and Hurwitz equivalence as an easy, at first sight, tool of controlling the topology of singular fibrations (over a disk) that often appear in algebraic geometry. Then, on the example of the first nonabelian braid group B_3, closely related to the modular group, I will try to show that the resulting group theoretic problem is much wilder than it might seem: the number of equivalence classes of the monodromy factorizations of a given element may grow exponentially in length.

References

[1] A. Degtyarev, *Hurwitz equivalence of braid monodromies and extremal elliptic surfaces*, http://arxiv.org/abs/0911.0278v1

Braid monodromy and Hurwitz equivalence

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ABSTRACT

We introduce a nice geometrical object called associahedron. We explain the relation between planar binary trees and faces of associahedron. We define the fat-realization of associahedron. We summarize the construction of realizations of two polytopes which are truncation of associahedron and give a formula for triangulation of associahedron.

References

[1] J.L. Loday, *Realization of the Stasheff polytope*, Archiv der Mathematik 83 (2004), 267-278.

[2] J. L. Loday, *Parking functions and triangulation of the associahedron*, (2005), arXiv:math/0510380v1

[3] M. Markl, *Simplex, associahedron, and cyclohedron*, in "Higher homotopy structures in topology and mathematical physics", Contemp. Math. 227 (1999), 235-265 Amer. Math. Soc., Providence, RI.

[4] P. May, *The geometry of iterated loop spaces*, Lecture Notes in Math, vol. 271, 1972, Springer-Verlag.

[5] J. Stasheff, *Homotopy associativity of H-spaces I.,II.*, Trans. Amer. Math. Soc., 108 (1963), 275-312.

[6] J. Stasheff, *From operads to physically inspired theories*, in Loday et.al.(ed) : Operads, proceeding of renaissance conferences, AMS, 1997.

[7] J. Stasheff, *The pre-history of operads*, in Loday et.al.(ed) : Operads, proceeding of renaissance conferences, AMS., 1997.

Knot Floer Homology and Contact Surgeries

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ABSTRACT

The knot Floer homology is a very powerful Floer theoretic invariant of knots in 3-manifolds which was recently introduced by Ozsváth and Szabó, also independently by Rasmussen. It detects the genus of a knot and whether a given knot is fibred. It also provides lower bounds for the four ball genera of knots in the three-sphere. The purpose of this talk is to discuss yet another application of the knot Floer homology in low-dimensional topology. Using the underlying filtered chain complex of the knot Floer homology, we will calculate some invariants of contact manifolds that are obtained by surgery on a Legendrian knot.

References

[1] Ozsváth, Peter; Szabó, Zoltán, *Holomorphic disks and knot invariants*. Adv. Math. **186** (2004), no. 1, 58–116.

[2] Ozsváth, Peter; Szabó, Zoltán, *Heegaard Floer homology and contact structures*. Duke Math. J. **129** (2005), no. 1, 39–61.

[3] Ozsváth, Peter S.; Szabó, Zoltán, *Knot Floer homology and integer surgeries*. Algebr. Geom. Topol. **8** (2008), no. 1, 101–153.

Hilbert functions of one-dimensional Cohen-Macaulay local rings

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ABSTRACT

The Hilbert function of a local ring is defined as the Hilbert function of the corresponding associated graded ring. Since the good properties of a local ring can not be carried onto the corresponding associated graded ring, there is still not enough knowledge on the possible Hilbert functions of this kind of ring, even if the ring is one dimensional.

This poster presentation gives a short survey about the basic facts of the theory of the Hilbert functions of a one-dimensional Cohen-Macaulay local rings.

References

[1] Macaulay, *Some properties of enumeration in the theory of modular system*, Proc. of London Math. Soc. 26 (1927), 531-555.

[2] S.Kleiman, *Theorie des intersections et theoreme de Riemann-Roch,in:SGA6*, Lecture Notes in Math 225,Springer, 1971.

[3] M. E. Rossi, G. Valla G and W.V. Vasconcelos, *Maximal Hilbert Functions*, Result. Math.39 (2001) ,99-114 .

[4] D.G. Northcott, *A note on the coefficients of the abstract Hilbert function*, J.London Math.Soc., 35(1960), 209-214.

[5] J. Elias, *Characterization of the Hilbert-Samuel polynomial of curve singularities*, Comp.Math.,74 (1990), 135-155.

[6] O. Orecchia, *One-dimensional local rings with reduced associated graded ring and their Hilbert functions*, Manuscripta Math., **3**2 (1980) 391-405.

Heegaard Floer meets Seiberg–Witten

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ABSTRACT

Floer homology is a generalization of Morse homology to infinite dimensional spaces. Since its introduction by Andreas Floer, it has led to many powerful invariants of low-dimensional manifolds. The aim of this talk is to introduce the audience to Heegaard Floer and Seiberg–Witten Floer homologies of 3-dimensional manifolds and to explain the philosophy behind their equivalence.

References

[1] P. Kronheimer, T. Mrowka, *Monopoles and three-manifolds*. New Mathematical Monographs, **10**, Cambridge University Press, Cambridge, 2007.

[2] C. Kutluhan, Y.-J. Lee, C. H. Taubes, *HF=HM I : Heegaard Floer homology and Seiberg–Witten Floer homology*, arXiv:1007.1979.

[3] R. Lipshitz, *A cylindrical reformulation of Heegaard Floer homology*. Geom. Topol. **10** (2006), 955-1097.

[4] P Ozsváth, Z. Szabó, *Heegaard diagrams and Floer homology*. arXiv:math/0602232.

Minimal free resolutions of some Gorenstein monomial curves

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ABSTRACT

A monomial curve C in the affine space A^4 has a parametrization

$$x_1 = t^{n_1},\ x_2 = t^{n_2},\ x_3 = t^{n_3},\ x_4 = t^{n_4},$$

where n_1, n_2, n_3, n_4 are positive integers with $\gcd(n_1, n_2, n_3, n_4) = 1$. The graded homomorphism between $k[x_1, x_2, x_3, x_4]$ and $k[t]$ gives $k[x_1, x_2, x_3, x_4]/I(C) \cong k[t^{n_1}, t^{n_2}, t^{n_3}, t^{n_4}]$, where $I(C)$ is the defining ideal of C. When the numerical semigroup $< n_1, n_2, n_3, n_4 >$ is symmetric, or equivalently, the associated local ring $k[[t^{n_1}, t^{n_2}, t^{n_3}, t^{n_4}]]$ is Gorenstein, then C is called a Gorenstein monomial curve.

In this talk, motivated by the fact that minimal free resolutions give some information about the singularity, I will give explicit minimal free resolution for the coordinate ring of C and its tangent cone. In particular, I will talk about when the tangent cone is Gorenstein in embedding dimension four. This is a joint work with Mesut Şahin [1].

References

[1] P. Mete and M. Şahin, Minimal free resolutions of Gorenstein monomial curves in A^4, (Preprint).

Kaplansky's Theorem for Vector Bundles

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ABSTRACT

In this study, we focus on two classes of modules: The projective R-modules and the almost projective R-modules for a commutative ring R with unity. Then we center on the category of quasi-coherent sheaves over some special projective schemes and the several new notions of (infinite dimensional) vector bundles attained to these classes as proposed by Drinfeld. We prove structural results relative to the different generalization of vector bundles in terms of certain filtrations of locally countably generated quasi-coherent sheaves. In the case in which the vector bundles are built from the class of projective R-modules, our structural theorem yields a version of Kaplansky's Theorem for infinite dimensional vector bundles on these special projective schemes.

This is a joint work with Assoc. Prof Sergio Estrada.

References

[1] V. Drinfeld, *Infinite-dimensional vector bundles in algebraic geometry.* P. Etingof, R. Vilademir, and I.M. Singer, (Ed), The unity of mathematics, 263–304 Boston: Birkhäuser (2006).

[2] E. Enochs and S. Estrada, *Relative homological algebra in the category of quasi-coherent sheaves.* Advances in Mathematics, **194** (2005) 284–295.

[3] E. Enochs, S. Estrada, J.R. Garcia Rozas and L. Oyonarte, *Flat covers in the category of quasi-coherent sheaves over the projective line.* Communications in Algebra, 32 (2004a), 1497–1508.

[4] E. Enochs, S. Estrada, J.R. Garcia Rozas, and L. Oyonarte, *Flat and cotorsion quasi-coherent sheaves, Applications.* Algebras and Representation Theory, **7** (2004b), 441–456.

[5] E. Enochs, S. Estrada, J.R. Garcia Rozas, and L. Oyonarte, *Generalized quasi-coherent sheaves.* Journal of Algebra and Its Applications, **2**(1), (2003), 1–21.

[6] E. Enochs, S. Estrada, and B. Torrecillas, *An elementary proof of Grothendieck's Theorem*. P. Goeters, and O. M. G. Jenda, (Ed), Abelian groups, rings, modules, and homological algebra (151–157). Boca Raton: Chapman & Hall/CRC, 2006.

[7] S. Estrada, P.G. Asensio, M. Prest and J. Trlifaj, *Model category structures arising from Drinfeld vector bundles*. Preprint arXiv:0906.5213v1, 2009.

[8] A. Grothendieck, *Sur la classification des fibres holomorphes sur la sphere de Riemann*. American Journal of Mathematics, **79** (1957), 121–138.

[9] J.P. Serre, *Faisceaux algebriques coherents*. Annals of Mathematics, **61** (1955), 197–278.

[10] J.P. Serre, *Modules projectifs et espaces fibres a fibre vectorielle*. Seminaire P. Dubreil, M. L. Dubreil-Jacotin et C. Pisot 11, 1957-1958, Paris, Expose 23.

Full Lutz twist along the binding of an open book

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ABSTRACT

For a transverse knot T in a contact 3-manifold, we exhibit a Legendrian four-component link $L = L_1 \sqcup L_2 \sqcup L_3 \sqcup L_4$ such that T is the transverse push-off of L_1 and contact $(+1)$-surgery on $\mathbb{L}$ is equivalent to a *full* Lutz twist along T. As an application we demonstrate the effect of a full Lutz twist on a compatible open book.

This is a joint work with Burak Özbağcı.

References

[1] F. Ding, H. Geiges and A. I. Stipsicz, *Lutz twist and contact surgery*, Asian J. Math. **9** (2005) 57–64

[2] H. Geiges, *An Introduction to Contact Topology*, Cambridge studies in advanced mathematics **109**, Cambridge University Press (2008).

[3] B.Özbagci and M. Pamuk, *Full Lutz twist along the binding of an open book*, Geometria Dedicata **147** (2010) 389–396

[4] B. Özbagci and A. I. Stipsicz, *Surgery on contact 3-manifolds and Stein surfaces*, Bolyai Society Mathematical Studies, **13**. Springer-Verlag, Berlin; János Bolyai Mathematical Society, Budapest, 2004.

Equivariant CW-Complexes and The Orbit Category

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ABSTRACT

This talk is about the paper which is a joint work with I. Hambleton and E. Yalçın. A good algebraic setting for studying actions of a group with isotropy given in a given family of subgroups is provided by the modules over the orbit category. In this talk, I will briefly talk about the orbit category and then I will give the example of the group S_5 with isotropy in the family of cyclic subgroups..

References

[1] I. Hambleton, S. Pamuk and E. Yalçın, *Equivariant CW-Complexes and the Orbit Category*, arXiv:0807.3357v3.

Milnor fillable contact structures are universally tight

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ABSTRACT

We show that the canonical contact structure on the link of a normal complex surface singularity is universally tight. This is a joint work with Yankı Lekili.

References

[1] Y. Lekili, B. Özbağcı, *Milnor fillable contact structures are universally tight*, arXiv:1005.2385v3

Hilbert Function and Free Resolution

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ABSTRACT

If M is a finitely generated graded module over $k[x_1, ..., x_n]$, then the Hilbert function of M is the numerical function $H_M(s) = \dim_k M_s$. A free resolution of M is an exact sequence

$$\mathcal{F} : \cdots \to F_2 \to^{f_2} F_1 \to^{f_1} F_0 \to^{f_0} M \to 0$$

with $F_i \simeq R_i^r$ for some $r \in \mathbb{N}$, for all i, for any graded resolution of the module M we have

$$H_M(i) = \sum_{j=0}^{m} (-1)^j H_{F_j}(i)$$

which enables us to compute the Hilbert function of M .

This poster is a survey link between Hilbert function and free resolution. In this, by using the technique of Schreyer's, we get the Syzygy module, and we construct free resolution. Then we will compute the Hilbert function from the free resolution.

References

[1] D. Eisenbud, *Commutative Algebra with a view Toward Algebraic Geometry*, in: Graduate text in Mathematics, vol.150,Springer-Verlag, New York, 1995.

[2] D. Eisenbud, *The Geometry of Syzygies, A Second Course in Commutative Algebra and Algebraic Geometry*, in: Graduate text in Mathematics,vol.229,Springer-Verlag, New York, 2005

On real open book decompositions

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ABSTRACT

We introduce the real structure on fiber bundles over circle and on open book decompositions, and study the monodromy properties of them. We also give a classification of real torus bundle over circle using the action of $\mathrm{SL}_2(\mathbb{Z})$ on the Poincaré disk endowed with the Farey tessellation.

References

[1] N. Salepci, *Real elements in the mapping class group of T^2*, http://arxiv.org/abs/1006.0752

Quadric-line arrangements and ball-quotient orbifolds

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ABSTRACT

In this work, by using orbifold Chern numbers we will disscuss the ball-quotient orbifolds whose underliying arrangement is quadric-line arrangement, and give a list of ball-quotient quadric-line arrangements and exhibit the covering relations among them.

References

[1] Barthel, G., Hirzebruch, F. and Höfer, T., *Geradenkonfigurationen und Algebraische Flächen*, Aspects of Mathematics, D4, Friedr. Vieweg & Sohn, Braunschweig, 1987

[2] Hirzebruch, F. *Arrangements of lines and algebraic surfaces*. Arithmetic and geometry, Vol. II, Progr. Math. **36**, 113–140, Birkhause, 1983.

[3] Kobayashi, R., *Uniformization of complex surfaces*, Kähler metric and moduli spaces, Adv. Stud. Pure Math. **18** (1990) 2, 313–394.

[4] Sarıoğlu, C.C., *Combinatorics and Topology of Conic-Line Arrangements*, Ph.D. Thesis, Dokuz Eylül Üniversitesi, Fen Bilimleri Enstitüsü, 2010.

[5] Uludağ, A. M., *On branched coverings of* $\mathbb{P}^n$ *by products of discs*. Internat. J. Math., **14**, (2003) 10, 1025–1036.

[6] Uludağ, A. M., *Covering relations between ball-quotient orbifolds*. Math. Ann., **328** (2004) 3, 503–523.

[7] Uludağ, A. M., *Orbifolds and their uniformization*. Arithmetic and geometry around hypergeometric functions, Progr. Math.**260** (2007), 373–406, Birkhauser.

[8] Yoshida, M., *Fuchsian differential equations*. Aspects of Mathematics, E11, Friedr. Vieweg & Sohn, Braunschweig, 1987.

Counting lines on a $K3$ surface

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ABSTRACT

I will first give a survey of what is known in counting the number of lines on algebraic surfaces. Surprisingly the basic questions on this topic are still open problems. I will conclude my talk by speculating about the possible methods of counting lines on $K3$ surfaces.

Hilbert Basis of the Lipman Semigroup

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ABSTRACT

In this talk, we introduce a new method to compute the Hilbert basis, a finite set of generators, for the semigroup of certain positive divisors supported on the exceptional divisor of a normal surface singularity. We also discuss certain properties of the toric variety associated to a simple surface singularity.

References

[1] M. Şahin, *Hilbert basis of the Lipman semigroup*, arXiv:1009.0385v2

Higher mapping class groupoids

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ABSTRACT

This is an essay to define a higher modular groupoid. The usual modular groupoid of triangulation flips admits ideal triangulations of surfaces of fixed genus and punctures as objects and flips as morphisms. This groupoid has an extension, which I call the groupoid of orientation twists and triangulation flips (OTTF). The conjecture is: the π_1 of the OTTF groupoid is the outomorphism group of a free group.

References

[1] R.C. Penner, *Lambda lengths*, www.ctqm.au.dk/research/MCS/lambdalengths.pdf

[2] R.C. Penner and D. Saric, *Teichmuller theory of the punctured solenoid*, arXiv:math/0508476

[3] S. Fomin and D. Thurston, *Cluster algebras andtriangulated surfaces , Part II: Lambda lengths*, www.math.columbia.edu/∼dpt/writing/CATS-geom.pdf

Topology of Phi-Free Submanifolds

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ABSTRACT

Harvey and Lawson showed that for any calibration phi there is an integer bound for the homotopy dimension of a strictly phi-convex domain and constructed a method to get these domains by using phi-free submanifolds. I will explain how to get phi-free submanifolds with different homotopy types in certain calibrated geometries and talk about the recent results about their existence.

References

[1] İ. Ünal, *Topology of Phi Convex Domains in Calibrated Manifolds*, Preprint.

[2] İ. Ünal, *Examples of Phi Critical Submanifolds*, Preprint.

Fusion systems and constructing free actions on products of spheres

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ABSTRACT

I'll talk about a recursive method for constructing free group actions on products of spheres. Given a smooth action of a finite group G on a manifold M, we construct a smooth free action on $M \times \mathbb{S}^{n_1} \times \cdots \times \mathbb{S}^{n_k}$ when the set of isotropy subgroups of the G-action on M can be associated to a fusion system satisfying certain properties. This talk is based on our joint paper [8] with Ergün Yalçın.

References

[1] A. Adem and J. H. Smith, *Periodic complexes and group actions*, Ann. of Math. (2) **154** (2001), 407–435.

[2] G. Bredon, *Equivariant cohomology theories*, Lecture notes in mathematics 34, Springer-Verlag, 1967.

[3] C. Broto, R. Levi, and R. Oliver, *The homotopy theory of fusion systems.*, J. Amer. Math. Soc. 16 (2003), no. 4, pp. 779–856

[4] W. Lück, *Survey on classifying spaces for families of subgroups*, Infinite groups: geometric, combinatorial and dynamical aspects, 269–322, Progr. Math., 248, Birkhäuser, Basel, 2005.

[5] W. Lück and R. Oliver, *The completion theorem in K-theory for proper actions of a discrete group*, Topology 40 (2001), no. 3, 585–616.

[6] S. Park, *Realizing a fusion system by a single group*, preprint.

[7] K. Ragnarsson and R. Stancu, *Saturated fusion systems as idempotents in the double Burnside ring*, preprint.

[8] Ö. Ünlü and E. Yalçın, *Fusion systems and constructing free actions on products of spheres*, preprint.

Parametrising Arithmetic Curves

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ABSTRACT

It is well known that graphs embedded in topological surfaces, which are called dessin d'enfant by Grothendieck, correspond to arithmetic curves, i.e. an algebraic curve defined over a number field. In this talk we will define two hermitian lattices, and see that every point of the lattice corresponds to a particular graph embedded in the 2 dimensional sphere.