NINTH SHANGHAI CONFERENCE

on

COMBINATORICS

May 24 - 28, 2017

Shanghai Jiao Tong University

Shanghai，China

Sponsored by
Shanghai Jiao Tong University

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Program of Ninth Shanghai Conference on Combinatorics

5.23	14:00-22:00		Registration (Manhattan Business Hotel(曼哈顿酒店))
	18:30-20:30		Dinner (Manhattan Business Hotel)
5.24	08:20		Leaving Manhattan Business Hotel for 100 Chenruiqiu Building(陈瑞球楼100号) by bus (Meeting place: Hotel Lobby)
	09:00-09:50		Opening ceremony, Photographing(100 Chenruiqiu Building)
	09:50-10 :10		Coffee Break
	Chair: Jiayu Shao (100 Chenruiqiu Building)	10:10-11:00	Richard A. Brualdi(University of Wisconsin at Madison) Title: Permutation and Alternating Sign Matrices: Integral Modules, Rational Cones, Convex Polytopes
		11:00-11:50	Chaoping Xing(Nanyang Technological University) Title: Three Combinatorial Problems in Theoretical Computer Science
	12:20-13:30		Lunch (Dazhiju (大智居))
5.24	Chair: Lijun Ji (Room A[1]) Chair: Alexander Gavrilyuk (Room B[2])	14:00-14:25	Joseph A. Thas(Ghent University) Title: Generalized ovals and generalized ovoids (Room A) Jack Koolen(University of Science and Technology of China) Title:Recent progress on 2-walk-regular graphs (Room B)
		14:25-14:50	Fengming Dong(Nanyang Technological University) Title: Uniquely restricted matchings and an extension of G-parking functions(Room A) Shaowei Sun(SungKyunKwan University) Title: Extremal Graphs on Normalized Laplican Spectral Radius (Room B)
		14:50-15:15	Ying-Ying Tan(Anhui University) Title: The Terwilliger algebra of $J(N, D)$ from the viewpoint of group representations (Room A) Eugen Mandrescu(Holon Institute of Technology) Title: A refined version of the Roller Coaster Conjecture (Room B)
		15:15-15:40	Mingchun Xu(South-China Normal University) Title: The properties of the bordered matrix of symmetric block design (Room A) Masoud Karimi (Anhui university) Title: Adjacency spectrum and invariant factors of integral complete multipartite graphs (Room B)
	15:40-16 :10		Coffee Break

[1] 8th Floor, Network and Information Center (网络信息中心8楼)

[2] 9th Floor, Network and Information Center (网络信息中心9楼)

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	Chair: Lihua Feng (Room B)	16:35-17:00	Zeying Wang (Michigan Technological University) Title: Non-existence of partial difference sets in Abelian groups of order $8p^3$ (Room A) Zhibin Du(Zhaoqing University) Title: The P-vertices and P-sets of real symmetric matrices (Room B)
		17:00-17:25	Yan Zhu(Shanghai Jiao Tong University) Title: Relative t-designs in one shell of Johnson association schemes (Room A) Li Wang(Nanjing Normal University) Title: More progress on the Hamilton-Waterloo problem (Room B)
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	Chair: Charles Colbourn	18:10-18:30	ICA Medals Ceremony (Harvest Festival Hotel)
	18:30-20:30		Banquet (Harvest Festival Hotel)

5.25	08:20		Leaving Manhattan Business Hotel for Network and Information Center by bus (Meeting place: Hotel Lobby)
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		09:50-10:40	Klaus Metsch(University of Giessen) Title: Erdős-Ko-Rado theorems in buildings
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Abstracts

Cycle-supermagic labeling for some families of graphs

Gohar Ali
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Abstract

A simple graph $G = (V(G), E(G))$ admits a cycle-covering if every edge in E belongs to at least one subgraph of G isomorphic to a given cycle C. The graph G is C-magic if there exists a total labeling $f : V(G) \cup E(G) \to \{1, 2, \ldots, |V(G)| + |E(G)|\}$ such that for every subgraph $H' = (V(H'), E(H'))$ of G isomorphic to C, the sum $\sum_{v \in V(H')} f(v) + \sum_{e \in E(H')} f(e)$ is constant. When $\{f(v) : v \in V(G)\} = \{1, 2, \ldots, |V(G)|\}$ then G is said to be C-supermagic.

In the present paper, we investigate the cycle-supermagic behavior of disjoint union of graphs.

This is a joint work with Muhammad Asif in Department of Mathematics Islamia College, Muhammad Numan in Department of Mathematics COMSATS Institute of Information Technology and Andrea Semaničová-Feňovčíková in Technical University.

Keywords: *Edge-covering, cycle-magic labeling, cycle-supermagic labeling, disjoint union of graphs*

Design Theory from the Viewpoint of Algebraic Combinatorics

Eiichi Bannai
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Abstract

We give an overview on the study of various types of designs. Main concerns are on Fisher type lower bounds and the classification problems of tight designs. The emphasis will be on the analogy between spherical t-designs and combinatorial t-designs, and the analogy between Euclidean t-designs and relative t-designs in association schemes. We also discuss designs of harmonic indices T. This talk is based on the following two papers, as well as on some more recent developments.

[1] Eiichi Bannai, Etsuko Bannai, Hajime Tanaka, Yan Zhu: Design theory from the viewpoint of algebraic combinatorics, Graphs and Combinatorics 33 (2017), 1-41.

[2] Yan Zhu, Eiichi Bannai, Etsuko Bannai, Kyoung-Tark Kim, Wei-Hsuan Yu: On spherical designs of some harmonic indices, Electronic Journal of Combinatorics 24 (2017), P2.14.

AG codes from the GK and the GGS curves

Daniele Bartoli
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Abstract

Giulietti-Korchmáros curve and Garcia-Güneri-Stichtenoth curve are well known families of maximal curves, that is curves attaining the maximum possible number of rational points with respect to their genus. In this talk we provide Algebraic-Geometric (AG) codes associated with these two families of curves.

In particular, we investigate multi-point AG codes associated with the GK maximal curve, starting from a divisor which is invariant under a large automorphism group of the curve, constructing families of codes with large automorphism groups.

Also, we determine the Weierstrass semigroup at all $\mathbb{F}_{q^2}$-rational points of the GGS curve and we compute the Feng-Rao designed minimum distance for infinite families of codes associated with GGS curve, as well as the automorphism group. As a result, some linear codes with better relative parameters with respect to one-point Hermitian codes are discovered. Finally, we provide some classes of quantum and convolutional codes relying on the constructed AG codes.

This is a joint work with M. Montanucci in University of Basilicata and G. Zini in University of Firenze.

Keywords: Algebraic-Geometric codes, GK curve, GGS curve

Inverting the Turán Problem

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Abstract

Classical questions in graph theory ask what is the maximum number of edges in an $\mathcal{F}$-free subgraph of G, for some fixed family of graphs $\mathcal{F}$. This is the extremal number $\text{ex}(G, \mathcal{F})$. For example, the Turán and Zarankiewicz problems ask about $\text{ex}(K_n, \mathcal{F})$ and $\text{ex}(K_{n,n}, \mathcal{F})$ respectively. In particular, these study the corresponding asymptotics when $n \to \infty$. Or, when $\mathcal{F} = \mathcal{C}$ is the family of cycles, this becomes the graphic matroid rank, and is considered as a function of G for various different G.

The second example inspires the inverted problem of optimising some monotone graph parameter over all host graphs G for which $\text{ex}(G, \mathcal{F}) = k$, where now both k and $\mathcal{F}$ are fixed. We will explore the most natural question: what is the largest possible number of edges among all G with $\text{ex}(G, \mathcal{F}) = k$?

This is joint work in progress with Christopher Cox (CMU).

Permutation and Alternating Sign Matrices: Integral Modules, Rational Cones, Convex Polytopes

Richard A. Brualdi
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Abstract

Permutations are fundamental combinatorial objects. The $n \times n$ permutation matrices generate an integral module (integral matrices with all row and column sums equal), a rational cone (nonnegative matrices with all row and column sums equal), and a convex polytope (nonnegative matrices with all row and column sums equal to 1). Alternating sign matrices (ASMs) are natural combinatorial generalizations of permutation matrices and also generate an integral module, a rational cone, and a convex polytope. An integral module has a minimal generating set, a rational cone has a minimal Hilbert basis, and a convex polytope has a defining set of linear inequalities and extreme points. We shall elaborate

on these ideas. This talk is taken from some joint work with Geir Dahl and some joint work with Seth Meyer.

New results on partitioned difference families

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Abstract

A partitioned (G, K, λ) difference family is a partition of an additive group G into subsets with sizes from K whose lists of differences cover, altogether, each non-zero element of G exactly λ times. I will present old and new results on partitioned $(G, \{1, k\}, k-1)$ difference families and a new infinite class of partitioned $(G, \{4n^2 - 2n, 4n^2, 4n^2 + 2n\}, 4n^2)$ difference families for suitable groups G such that $o(G) \equiv 4n^2 (\mod 8n^2)$.

The Extreme Points of the polytope of Centrosymmetric Doubly Stochastic Matrices

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Abstract

Let Ω_n be the set all of $n \times n$ doubly stochastic matrices. It is well-known that Ω_n is a polytope whose extreme points are the $n \times n$ permutation matrices. Let $\Omega_n^s, \Omega_n^{hs}$ and Ω_n^π, denote the sets of symmetric doubly stochastic matrices, Hankel symmetric doubly stochastic matrices and centrosymmetric doubly stochastic matrices respectively. It is clear that $\Omega_n^s, \Omega_n^{hs}$ and Ω_n^π are sub-polytopes of Ω_n. The extreme points of Ω_n^s and Ω_n^{hs} were discovered, while the extreme points of Ω_n^π were not characterized completely. We determine all the extreme points and give characterizations of the permutation matrices which generated the extreme points.

This is a joint work with Richard Brualdi.

Spectral radius and signless Laplacian spectral radius for a graph to be Hamilton-connected

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Abstract

In this paper, we establish several spectral conditions for a graph with minimum degree and order to be Hamilton-connected in terms of spectral radius, signless Laplacian spectral radius and spectral radius of its complement graph, which strengthen and extend some known results.

On the Placement Delivery Array Design in Coded Caching Scheme

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Abstract

Caching is a promising solution to satisfy the ever increasing demands for the multi-media traffics in wireless network. Coded caching is a recently proposed technique that can further decreases delivery rate during peak traffic times. However, to implement the coded caching schemes, each file has to be split into F packets, which usually increases exponentially with the number of users K. Thus, designing caching schemes that decrease the order of F is meaningful for practical implementations. In this talk, by reviewing the Ali-Niesen caching scheme, the placement delivery array (PDA) design problem is firstly formulated to characterize a coded caching scheme with a single array. Moreover, we show that, through designing appropriate PDAs, new coded caching schemes can be discovered. Secondly, it is shown that the Ali-Niesen scheme corresponds to a special class of PDA. Thirdly, we present two new constructions of PDAs for caching system, wherein the cache size of each user M (identical cache size is assumed at all users) and the number of files N satisfies $M/N = 1/q$ or $(q-1)/q$ (q is an integer such that $q \geq 2$). The new constructions can decrease the value of F significantly by increasing little delivery rate.

From Optical Orthogonal Codes to Cyclic Steiner Quadruple Systems

Wensong Chu
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Abstract

One of the main objectives of this paper is to set up a close relationship between optical orthogonal codes (OOC) and cyclic t-designs. The study of OOC's is motivated by their applications in optical code-division multiple access networks and they have been studied extensively in the past two decades. t-designs are an important topic in combinatorial design theory.

In [2], we gave a new recursive construction for OOC's. In this paper, based on the close relationship between OOC's and cyclic t-designs, we are able to apply the new recursive construction to cyclic Steiner Quadruple Systems (SQS), and gain a new perspective on the structure of cyclic SQS's.

We will take a new look at Cho's constructions [1] and Grannell and Griggs's product constructions [3] for cyclic SQS's. Furthermore, several new recursive constructions for cyclic SQS's are given, and many new infinite families of cyclic SQS's are constructed.

This is joint work with Solomon W. Golomb.

References

[1] C.J. Cho. *On cyclic Steiner quadruple systems.* Irs Combinatoria, 10, pp. 423-830, 9930.

[2] Wensong Chu and Solomon W. Golomb. *A new resursiee construction on optical orthogonal codes.* Sumbitted to IEEE Transactions on Information Theory.

[3] M.J. Grannell and T.S. Griggs. *Product constructions for cyclic block designs, I. Steiner quadruple systems.* Journal of Combinatorial Theory(A), 36, pp. 56-65, 1984.

Covering Perfect Hash Families

Charles Colbourn
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Abstract

Covering arrays are used to test the correctness of complex engineered systems with k components each having v options, when collections of at most t component options can cause failures. Of most interest are cases when $2 \leq t \leq 6$ and

$2 \leq v \leq 10$, but k can be quite large, perhaps in the hundreds or thousands. The construction of covering arrays with few tests is a challenging mathematical and computational problem. Covering perfect hash families represent certain covering arrays compactly. In this talk we describe how covering perfect hash families lead to an improvement upon the best known asymptotic upper bound for the minimum number of tests (rows) in a covering array with v symbols, k columns, and strength t. We then show that the compact representation makes the computation of 'large' covering arrays meeting the new bound feasible: One method uses the deterministic Lovász local lemma, another uses a condiitional expectation approach. For example, we report on improved bounds for covering arrays of strength 3 with $k \leq 10000$, and demonstrate that the methods remain feasible even for strength 7, for which no explicit computational results have earlier been reported.

We close by outlining connections with finite fields and finite geometry, and suggest some important next steps.

This is joint work with Erin Lanus and Kaushik Sarkar (ASU).

The P-vertices and P-sets of real symmetric matrices

Zhibin Du
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Abstract

The concepts of P-vertex and P-set of real symmetric matrices are proposed based on the multiplicity of eigenvalues of matrices and Cauchy interlacing theory. Suppose that A is a real symmetric matrix of order n. Denote by $m_A(0)$ the nullity of A. For a nonempty subset α of $\{1, 2, \ldots, n\}$, let $A(\alpha)$ be the principal submatrix of A obtained from A by deleting the rows and columns indexed by α. From Cauchy interlacing theory, $m_{A(\alpha)}(0) \leqslant m_A(0) + |\alpha|$. In particular, when $m_{A(\alpha)}(0) = m_A(0) + |\alpha|$, we call α a P-set of A, and when $m_{A(\{i\})}(0) = m_A(0) + 1$, we call i a P-vertex of A. In this talk, we will present some properties regarding the P-vertices and P-sets of real symmetric matrices, mainly including: the characterization of the trees G for which there exists a matrix A whose associated graph is G with a maximal number of P-vertices, and the characterization of the graphs G for which there exists a matrix A whose associated graph is G containing a P-set of maximal size.

This is a joint work with Carlos M. da Fonseca in Kuwait University.

Uniquely restricted matchings and an extension of G-parking functions

Fengming Dong
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Abstract

A matching M in a graph G is said to be uniquely restricted if M is the only perfect matching in the subgraph of G induced by vertices saturated by M. For any connected multigraph $G = (V, E)$ and a fixed vertex x_0 in G, there is a bijection from the set of spanning trees of G to the set of uniquely restricted matchings of size $|V| - 1$ in the bipartite graph $S(G) - x_0$, where $S(G)$ is obtained from G by subdividing each edge in G. Motivated by this observation, we extend the concept of G-parking functions of graphs to B-parking functions $f : X \to \mathbb{N}_0$ for any bipartite graph $H = (X, Y)$ and establish a bijection ψ from the set of uniquely restricted matchings in H to the set of B-parking functions of H. If M is a uniquely restricted matching of H of size $|X|$ and $f = \psi(M)$, then for any $x \in X$, $f(x)$ is interpreted by the number of some elements $y \in Y$ which are not saturated by M and are not externally B-active with respect to M in H which is an extension of the concept "externally active with respect to a spanning tree T in a connected graph".

Keywords: graph, spanning tree, G-parking function, B-parking function

Skew Standard Domino Tableaux and Partial Motzkin Paths

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Abstract

In this talk we establish a connection between standard domino tableaux with at most three rows and partial Motzkin paths. Moreover, we establish a connection between skew standard domino tableaux with at most three rows and a variant of partial Motzkin paths within the nonnegative quadrant and enumerate such tableaux with respect to the number of vertical dominoes in terms of linear combinations of Motzkin numbers. This talk is based on joint work with Sen-Peng Eu, Ting-Yuan Cheng and Yi-Lin Lee.

On tight sets of hyperbolic quadrics

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Abstract

A set M of points of a finite polar space $\mathcal{P}$ is called tight, if the average number of points of M collinear with a given point of $\mathcal{P}$ equals the maximum possible value. In the case when $\mathcal{P}$ is a hyperbolic quadric $Q^+(2n+1,q)$, the notion of tight sets generalises that of Cameron-Liebler line classes in $PG(3,q)$, whose images under the Klein correspondence are the tight sets of the Klein quadric $Q^+(5,q)$. Very recently, some new constructions and necessary conditions for the existence of Cameron-Liebler line classes have been obtained. In this talk, we will discuss a possible extension of some of these results to the general case of tight sets of hyperbolic quadrics.

Graphs with exactly two main eigenvalues

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Abstract

In 1978, Cvetković [1] posed a problem to classify graphs with k ($k \geq 2$) main eigenvalues. In this talk, we will focus on graphs with two main eigenvalues and show that they are very hard to be classified. In order to do that, we show the existence of a family of such graphs with an unbounded number of distinct valencies. We also construct a family of such graphs with an unbounded diameter. This is joint work with Jack Koolen, Zhi Qiao and Fenjin Liu [2].

References

[1] D. M. Cvetković, The main part of the spectrum, divisors and switching of graphs, *Publ. Inst. Math. (Beograd),* 23(37) (1978), 31–38.

[2] S. Hayat, J.H. Koolen, F. Liu and Z. Qiao, A note on graphs with exactly two main eigenvalues, *Linear Algebra Appl.*, 511 (2016), 318–327.

Adjacency spectrum and invariant factors of complete multipartite graphs

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Abstract

We give counterexamples to a result in F. Esser and F. Harary [1, Theorem 3] asserting that two nonisomorphic complete r-partite graphs with the same number of vertices have different spectral radii. We then derive some results on invariant factors and apply them to obtain relationship between the parameters of integral complete multipartite graphs and their integer eigenvalues. Necessary conditions for complete multipartite graphs to be integral are obtained.

References

[1] F. Esser and F. Harary, On the spectrum of a complete multipartite graph, *European J. Combin.* **1** (1980) 211–218.

Recent progress on 2-walk-regular graphs

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Abstract

In this talk I report some recent progress on the class of 2-walk-regular graphs. This is joint work with Jongyook Park and Zhi Qiao.

Simple 3-$(q+1,5,3)$ designs admitting an automorphism group PSL$(2,q)$ with $q \equiv 1 \pmod 4$

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Abstract

In this paper, we give the necessary and sufficient conditions for the existence of simple 3-$(q+1,5,3)$ designs admitting PSL$(2,q)$ as an automorphism group, where $q \equiv 1(\text{mod } 4)$. In the conditions, the classification of the simple 3-$(q+1,5,3)$ designs admitting PSL$(2,q)$ as an automorphism group is given and, for any positive integer n, a simple 3-$(5^n+1,5,3)$ design is given and it is minimal in λ when n is odd. Moreover, by the conditions, a method is given to find a simple 3-$(q+1,5,3)$ design and using the method we find a simple 3-$(10,5,3)$ design in which the value of the index λ is also minimal.

AMS Classifications: 05B05

Key words: 3-Designs; Projective special linear group; Automorphism group

A note on generalized cospectral graphs

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Abstract

The *spectrum* $\sigma(G)$ of a graph G consists of all the eigenvalues (together with their multiplicities) of its adjacency matrix $A(G)$. Two graphs G and H are called *generalized cospectral* if both $\sigma(G) = \sigma(H)$ and $\sigma(\overline{G}) = \sigma(\overline{H})$, where $\overline{G}$ $(\overline{H})$ is the complement of G (H). In this note, we firstly provide a sufficient condition ensuring only irrational orthogonal similarity between certain cospectral graphs. Secondly, we construct two families of generalized cospectral graphs such that graphs in one of these two families are Hamiltonian and graphs in the other family are not Hamiltonian.

Directed paths: from Ramsey to Pseudorandomness

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Abstract

Starting from an innocent Ramsey-theoretic question regarding directed paths in graphs, we discover a series of rich and surprising connections that lead into the theory around a fundamental result in Combinatorics: Szemeredi's Regularity Lemma, which roughly states that every graph (no matter how large) can be well-approximated by a bounded-complexity pseudorandom object. Using these relationships, we prove that every coloring of the edges of the transitive N-vertex tournament using three colors contains a directed path of length at least $\sqrt{N}$ $e^{log^* N}$ which entirely avoids some color. The unusual function log^* is the inverse function of the tower function (iterated exponentiation).

Pentagonal Tilings of Polygon

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Abstract

In the study for the classification of tilings of the sphere by congruent pentagons, we find it necessary to classify some simple families of combina- torial (i.e., ignore edge lengths and angles) tilings of sphere by pentagons. For combinatorial tilings of sphere, we further find it necessary to classify combinatorial tilings of n-gons, such that all vertices in the interior have degree 3, and there are very small number of p vertices on the boundary with degree > 3.

We describe some general constructions of pentagonal tilings of polygon. Then we try to show that these constructions produce all the tilings in some simple cases. We get the complete result for the case of $p = 0$. We describe what the classification should be in case of $p = 1$, and verify the classification for up to some number n. We also speculate the general picture for higher p. We believe that in general, the combinatorial structures of tilings of poly- gon or sphere with few vertices of negative curvature can be classified. For pentagonal tilings, positive curvature means vertices having degree 3. Our study of pentagonal tilings with few vertices of degree > 3 is the initial step toward the big goal.

This is a joint work with Do Kien Hoang and Min Yan of the Hong Kong University of Science and Technology.

Flows of signed graphs

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Abstract

Converting modulo flows into integer-valued flows is one of the most critical steps in the study of integer flows. Tutte and Jaeger's pioneering work shows the equivalence of modulo flows and integer-valued flows for ordinary graphs. However, such equivalence does not hold any more for signed graphs. This motivates us to study how to convert modulo flows into integer-valued flows for signed graphs. We generalize some early results by Xu and Zhang (Discrete Math. 299, 2005), Schubert and Steffen (European J. Combin. 48, 2015), and Zhu (J. Combin. Theory Ser. B 112, 2015), and show that, for signed graphs, every modulo $(2+\frac{1}{p})$-flow with $p \in \mathbb{Z}^+ \cup \{\infty\}$ can be converted/extended into an integer-valued flow.

In 1983, Bouchet proposed a conjecture that every flow-admissible signed graph has a nowhere-zero 6-flow. The best published result is Zýka's 30-flow and was recently improved to 12-flow by DeVos. As an application of our aforementioned results, we further strengthen DeVos' result for bridgeless signed graphs, and show that every bridgeless flow-admissible signed graph admits a nowhere-zero 11-flow. We also verifiy Bouchet's conjecture for signed graphs without edge-disjoint unbalanced circuits.

This is joint work with Jian Cheng, You Lu, and Cun-Quan Zhang

A refined version of the Roller-Coaster Conjecture

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Abstract

A graph is *well-covered* if all its maximal independent sets are of the same size [4]. If G is well-covered of order at least two, such that $G-v$ is well-covered for every vertex v, then G is a 1-*well-covered graph* [5]. If $\lambda > 0$ and $\lambda \cdot |S| \leq |N(S)|$ is true for every independent set S of a G, then G is a λ-*quasi-regularizable graph.* The *independence polynomial* $I(G;x)$ is the generating function of independent sets in a graph G [2]. Recently, the so-called Roller-Coaster Conjecture [3], saying that: "for every permutation σ of the set $\{\lceil \frac{\alpha}{2} \rceil, ..., \alpha\}$ there is a well-covered graph G with independence number α such that the coefficients (s_k) of $I(G;x)$ satisfy $s_{\sigma(\lceil \frac{\alpha}{2} \rceil)} < s_{\sigma(\lceil \frac{\alpha}{2} \rceil + 1)} < \cdots < s_{\sigma(\alpha)}$", was validated [1].

In this talk we show that for a λ-quasi-regularizable graph G, the upper part of the sequence (s_k) is in a non-increasing order. Further, we infer that the domain of the Roller-Coaster Conjecture can be shortened to

$$\{\left\lceil \frac{\alpha}{2} \right\rceil, \left\lfloor \frac{\alpha}{2} \right\rfloor + 1, ..., \min\left\{\alpha, \left\lceil \frac{n-1}{3} \right\rceil\right\}\}$$

for well-covered graphs, and to

$$\{\left\lceil \frac{2\alpha}{3} \right\rceil, \left\lceil \frac{2\alpha}{3} \right\rceil + 1, ..., \min\left\{\alpha, \left\lceil \frac{n-1}{3} \right\rceil\right\}\}$$

for 1-well-covered graphs, where α stands for independence number, while the cardinality n of the vertex set belongs to $\{2\alpha, 2\alpha+1, ..., 3\alpha-2\}$.

This is a joint work with Vadim E. Levit in Ariel University.

References

[1] J. Cutler, L. Pebody, *Maximal-clique partitions and the roller coaster conjecture*, Journal of Combinatorial Theory A **145** (2017) 25–35.

[2] I. Gutman, F. Harary, *Generalizations of the matching polynomial*, Utilitas Mathematica **24** (1983) 97–106.

[3] T. S. Michael, W. N. Traves, *Independence sequences of well-covered graphs: non-unimodality and the roller-coaster conjecture*, Graphs and Combinatorics **19** (2003) 403–411.

[4] M. D. Plummer, *Some covering concepts in graphs*, Journal of Combinatorial Theory **8** (1970) 91–98.

[5] J. W. Staples, *On some subclasses of well-covered graphs*, Journal of Graph Theory **3** (1979) 197–204.

Erdős-Ko-Rado theorems in buildings

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Abstract

The famous Erdős-Ko-Rado theorem states that the largest number of pairwise intersecting d-subsets of an n-set, $n \geq 2d$, is $\binom{n-1}{d-1}$. Also, for $n \geq 2d+1$, this bound is attained only by talking all d-subsets containing a given element of n-set. In this talk, we will recall Erdős-Ko-Rado type results in other geometric structures and present some new and recent results. One of the new results classifies all largest sets of lines in finite classical polar spaces such that no line of the set meets the perp of any other line of the set (provided $d > 2q$ for the rank d and the order q of the polar space

Derangements with an additional restriction

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Abstract

The derangement numbers count how many fixed point free permutations are there on a given number of elements. In our talk we describe a class of fixed point free permutations that are subjected to an additional restriction: some distinguished elements are forced to be in separate cycles. The counting sequences of these permutation classes have a number of interesting combinatorial and number theoretical properties.

The talk is based on a recent publication in Discrete Mathematics. The work is joint with C.-Y. Wang and P. Miska.

Combinatorial designs over finite fields

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Abstract

A 2-(v, K, λ) design over the field $\mathbb{F}_q$ is a collection $\mathcal{S}$ of subspaces of $\mathbb{F}_q^v$ with dimensions from K and the property that any 2-dimensional subspace of $\mathbb{F}_q^v$ is contained in exactly λ members of $\mathcal{S}$.

We present a few new theoretical results on this topic and we also present our pioneer work on a variant of this concept.

This is a joint work with Marco Buratti.

The integrally representable trees of norm 3

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Abstract

Smith, in the $1970's$, classified the connected graphs with spectral radius two. This classification is closely related to the classification of the irreducible root lattices.

In this talk I will discuss trees with spectral radius at most 3 and hence with smallest eigenvalue at least -3. We say that a graph G is integrally representable

with norm t, if there exists an integral matrix N such that the adjacency matrix A of G can be written as $A + tI = NN^T$. Note that an integrally representable graph G with norm t has smallest eigenvalue at least $-t$. In this talk we will classify the integrally representable trees of norm 3.

This is joint work with J. H. Koolen and Qianqian Yang.

Orientations of 1-Factorizations and the List Chromatic Index of Small Graphs

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Abstract

As starting point, we formulate a corollary to the Quantitative Combinatorial Nullstellensatz. This corollary does not require the consideration of any coefficients of polynomials, only evaluations of polynomial functions. In certain situations, our corollary is more directly applicable and more ready-to-go than the Combinatorial Nullstellensatz itself. It is also of interest from a numerical point of view. We use it to explain a well-known connection between the sign of 1-factorizations (edge colorings) and the List Edge Coloring Conjecture. For efficient calculations and a better understanding of the sign, we then introduce and characterize the sign of single 1-factors. We show that the product over all signs of all the 1-factors in a 1-factorization is the sign of that 1-factorization. Using this result in an algorithm, we attempt to prove the List Edge Coloring Conjecture for all graphs with up to 10 vertices. This leaves us with some exceptional cases that need to be attacked with other methods.

Generalised Veronese varieties

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Abstract

The Veronese varieties associated to the quadratic alternative algebras are representations of Moufang projective planes if the algebras are division algebras, and if not, they yield the Severi varieties. Those Veronese varieties can be described uniformly as a family of certain quadrics satisfying three axioms (the Mazzocca-Melone axioms). We explain this and have a look at the Veronese varieties that arise – or do not arise – if we endow a family of *singular* quadrics with those Mazzocca-Melone axioms.

On the Shape of a Set

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Abstract

In his much-cited 1966 paper "Can One Hear the Shape of a Drum?" Mark Kac proposed a theory of 'shape' for two-dimensional manifolds based on the spectrum and eigenfunctions of the Laplace operator.

We show that similar ideas apply to finite undirected graphs when the Laplace operator is replaced by the adjacency operator. This leads to a notion of 'shape' for arbitrary subsets of vertices of the graph.

We report on the basic construction and give various applications. This work originated from a study of the generalized octahedron and its associated permutation modules. We will state the main results on the incidence graphs of this simplicial complex.

Practical computation of autotopism groups of partial Latin rectangles

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Abstract

We experimentally compare methods for practically computing the autotopism groups of partial Latin rectangles (two backtracking methods and four graph theoretic methods) along with entry invariants. The aim is to identify the design goals for efficient software for computing these autotopism groups.

This is joint work with Raúl M. Falcón (U. Seville, Spain) and Daniel Kotlar (Tel-Hai College, Israel)

Extremal Graphs for Normalized Laplacian Spectial Radius

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Abstract

Let G be a graph with vertex set $V(G) = \{v_1, v_2, \ldots, v_n\}$ and edge set $E(G)$. For any vertex $v_i \in V(G)$, let d_i denote the degree of v_i. The normalized Laplacian matrix of the graph G is the matrix $\mathcal{L} = (\mathcal{L}_{ij})$ given by

$$\mathcal{L}_{ij} = \begin{cases} 1 & \text{if } i = j \text{ and } d_i \neq 0 \\ -\frac{1}{\sqrt{d_i\, d_j}} & \text{if } v_i v_j \in E(G) \\ 0 & \text{otherwise.} \end{cases}$$

In this talk, we give a lower bound on ρ_1 of connected graph G (G is not isomorphic to complete graph) and characterize the extremal graphs (that is, the second minimal normalized Laplacian spectral radius of connected graphs). As an application, we find the first $\lfloor \frac{n+2}{2} \rfloor$ minimal normalized Laplacian spectral radius of graphs with order n. Moreover, we obtain Nordhaus-Gaddum type results for ρ_1.

This is a joint work with K. C. Das.

Key Words: Normalized Laplaican spectral radius, Normalized Laplacian spread, Nordhaus-Gaddum type results.

References

[1] K. C. Das, S. Sun, Normalized Laplacian eigenvalues and energy of trees, Taiwanese J. Math. 20 (3) (2016) 491–507.

[2] F. K. Chung, Spectral graph theory, American Mathematical Soc., 1997.

[3] J. Li, J.-M. Guo, W. C. Shiu, Bounds on normalized Laplacian eigenvalues of graphs, Journal Inequalities Appl. 316 (2014) 1–8.

[4] H. Lin , M. Zhai, S. Gong, On graphs with at least three distance eigenvalues less than -1, Linear Algebra Appl. 458 (2014) 548–558.

The Terwilliger algebra of $J(N, D)$ from the viewpoint of group representations

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Abstract

Let $J(N, D)$ be the Johnson scheme ($2D \leq N$) and $T = T(x_0)$ its Terwilliger algebra, where x_0 is a base point. Each irreducible T-module W appears in the standard module and gives rise to a Leonard system $LS(W)$. In fact, the correspondence of W to $LS(W)$ is a bijection between the isomorphism classes of irreducible T-modules and the isomorphism classes of Leonard systems that arise from T of $J(N, D)$. In [2, Example 6.1(1)], it is written without proof that (1) the isomorphism class of $LS(W)$ is determined by a triple (ν, μ, d), where ν is the dual endpoint, μ the endpoint and d the diameter and (2) if $d \geq 1$, the triple (ν, μ, d) of nonnegative integers is restricted to be

$$0 \leq \frac{D-d}{2} \leq \nu \leq \mu \leq D-d \leq D, \quad (1)$$

$$d \in \{D-2\nu, \ \min\{D-\mu, N-D-2\nu\}\}. \quad (2)$$

In [1], we described the triple (ν, μ, d) of (1), (2) by two free parameters α, β of nonnegative integers with

$$0 \leq \alpha \leq \frac{D}{2}, \quad (3)$$

$$0 \leq \beta \leq \min\{D, \frac{N-D}{2}\}, \quad (4)$$

$$0 \leq \alpha + \beta \leq D. \quad (5)$$

In this talk, we find the meaning of the free parameters α, β from the viewpoint of group representations for the stabilizer of the base point x_0 in the automorphism group of $J(N, D)$. We show that there is the Terwilliger's list of (ν, μ, d) is complete, i.e, a bijection between the isomorphism classes of Leonard systems $LS(W)$ arising from T and the triples (ν, μ, d) of (1), (2) allowing $d = 0$.

This is a joint work with Xiaoye Liang and Tatsuro Ito.

References

[1] X. Liang, Y. Tan, T. Ito. An observation on Leonard system parameters for the Terwilliger algebra of the Johnson scheme $J(N, D)$, *Graphs and Combin.*, 2017, 33: 149-156.

[2] P. Terwilliger. The subconstituent algebra of an association scheme III, *J. Algebraic Combin.*, 1993, 2: 177-210.

The many paths to discrete curvature

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Abstract

Inspired by the recent developments in differential geometry and calculus of variations, there have been several approaches to identify a suitable notion of local (Ricci) curvature on non-smooth spaces, such as graphs and Markov chains. I will describe some of these approaches and review a few recent developments in this topic. Some of the consequences include a tight Cheeger inequality in abelian Cayley graphs, and diameter bounds on the spectral gap of the graph Laplacian.

Generalized ovals and generalized ovoids

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Abstract

A non-singular conic of the projective plane $PG(2, q)$ over the finite field $GF(q)$ consists of $q + 1$ points no three of which are collinear. For q odd, this non-collinearity condition for $q+1$ points is sufficient for them to be a conic; see Segre (1954). Generalizing, Segre considers sets of k points in $PG(2, q)$, $k \geq 3$, no three of which are collinear. The concept of a k-arc in $PG(2, q)$ was generalized to that of a k-cap in $PG(n, q)$; a k-cap of $PG(n, q)$, $n \geq 3$, is a set of k points no three of which are collinear. An elliptic quadric of $PG(3, q)$ is a cap of size $q^2 + 1$. In 1955, Barlotti and Panella independently showed that, for q odd, the converse is true. Also, $q^2 + 1$ is the maximum size of a k-cap in $PG(3, q)$ for $q \neq 2$. This leads to the definition of an ovoid of $PG(3, q)$ as a cap of size $q^2 + 1$ for $q \neq 2$ and, for $q = 2$, a cap of size 5 with no 4 points in a plane. Ovoids of particular interest were discovered by Tits (1962).

Arcs and caps can be generalized by replacing their points with m-dimensional subspaces to obtain generalized k-arcs and generalized k-caps.

In the talk we will consider generalized ovals and generalized ovoids. Also applications and open problems will be mentioned.

Recent advances on 2-factorizations of the complete graph

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Abstract

A 2-factorization of the complete graph K_v is a set $\mathcal{F}$ of spanning 2-regular subgraphs (i.e., 2-factors) whose edge-sets partition the edge-set of K_v. It is well known that K_v has a 2-factorization if and only if v is odd. However, if we specify t 2-factors, say $F_1, F_2, \dots, F_t$, and ask for the factorization $\mathcal{F}$ to contain α_i factors isomorphic to F_i, then the problem becomes much harder. When $t = 1$ we have the well-known Oberwolfach problem, attributed to G. Ringel who posed it in 1956. The case $t = 2$ is known as the Hamilton-Waterloo problem, whereas for greater values of t we speak of the generalized Oberwolfach problem. Although they have received much attention lately, these problems are still open.

In this talk, I will discuss recent progress on these topics obtained in joint work with Andrea Burgess and Peter Danziger.

Pentagonal Subdivision and Double Pentagonal Subdivision

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Abstract

Pentagonal subdivision and double pentagonal subdivision are two constructions that convert any tiling of an oriented surface into tilings by pentagons. When the constructions are applied to Platonic solids, then we get tilings of the sphere by congruent pentagons. Specifically, the pentagonal subdivision produces three 2-variable families of tilings of the sphere by 12, 24 and 60 congruent pentagons of edge length combination a^2b^2c. Then double pentagonal subdivision produces three rigid tilings of the sphere by 24, 48 and 120 congruent pentagons of edge length combination a^3bc.

Under the assumption that there is enough variation in edge lengths, we prove that the two constructions are the only tilings of sphere by congruent pentagons.

This is a joint work with Min Yan of the Hong Kong University of Science and Technology.

l_1-Embeddability of Generic Quadrilateral Möbius Maps

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Abstract

A connected graph G is called l_1-embeddable, if G can be isometrically embedded into the l_1-space. The generic quadrilateral Möbius maps (M, Γ) is a class of quadrilateral tiling of a Möbius strip with girth four. In this study, we prove that there is exactly one non-nulhomotopic shortest cycle in every l_1-embeddable (M, Γ), and we provide constructions of all such graphs.

Key words: l_1-embeddable; hypercube; quadrilateral Möbius map

More progress on the Hamilton-Waterloo problem

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Abstract

The *Hamilton-Waterloo problem* is the problem of determining whether K_v (for v odd) or K_v minus a 1-factor (for v even) has a 2-factorization in which there are exactly α C_m-factors and β C_n-factors. There have been many papers recently about this problem. Burgess et al. have made significant progress on the Hamilton-Waterloo problem for uniform odd cycle factors. In this talk, we will report some recent research results. We apply almost resolvable cycle systems as well as other combinatorial structures to give some solutions to the Hamilton-Waterloo problem for odd cycle factors which are left over in Burgess's paper. We also get some results on the Hamilton-Waterloo problem with even orders and completely solve the Hamilton-Waterloo problem in the case of C_3-factors and C_n-factors for $n = 4, 5, 7$.

Non-existence of partial difference sets in Abelian groups of order $8p^3$

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Abstract

In 2016, we proved the non-existence of two types of partial difference sets in Abelian groups of order 216 ($= 2^3 \cdot 3^3$), finalizing the classification of parameters for which a partial difference set of size at most 100 exists in an Abelian group. We recently were able to strongly restrict the parameters of hypothetical regular partial difference sets in Abelian groups of order $8p^3$, where $p \geq 3$ is a prime number. Combining this with some of the techniques from the order of 216 cases we are able to prove that no non-trivial regular partial difference sets exists in Abelian groups of order $8p^3$.

In this talk I will present the main ideas used in our proof. I will conclude the talk with some ongoing research and ideas for future research.

Repairable Secret Sharing

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Abstract

In this talk, we introduce the concept of repairable secret sharing schemes. Then some combinatorial methods are used to construct repairable threshold schemes. The security and efficiency of the constructions will be discussed.

Decompositions of edge-r-colored complete multidigraphs

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Abstract

Many problems in design theory and related areas can be phrased in terms of decompositions of complete graphs. We will survey some of the results on asymptotic existence in this area and applications of these results.

For example, one application of an extension to edge-colored digraphs is the construction of Steiner systems with certain automorphisms (e.g. reverse Steiner triple Systems).

A very general result about directed graphs was obtained by Anna Draganova and this author some years ago but is still unpublished. Let $\mathcal{D}$ be a family of (multi)digraphs whose edges are colored with elements from a set R of r colors. We assume that each $D \in \mathcal{D}$ has the property that for any two vertices x, y of D and any color i, there is at most one edge of color i directed from x to y. $\overline{K}_n^{(r)}$ will denote the complete edge-r-colored multidigraph where for any ordered pair (x, y) of distinct vertices, there are r edges directed from x to y, one of each of the r colors. We describe necessary and asymptotically suffi?cient conditions on n for the existence of a family $\mathcal{H}$ of subdigraphs of $\overline{K}_n^{(r)}$, each of which is an isomorphic copy of some digraph in $\mathcal{D}$, so that each edge of $\overline{K}_n(r)$ appears in exactly one of the subdigraphs in $\mathcal{H}$.

Our talk will describe these conditions and the proof techniques. Both conditions and techniques are similar to those of earlier results but interesting new twists arise. Extensions and applications of this result will be given.

Applications of linear algebraic methods in combinatorics and finite geometry

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Abstract

Most combinatorial objects can be described by incidence, adjacency, or some other $(0, 1)$-matrices. So one basic approach in combinatorics is to investigate combinatorial objects by using linear algebraic parameters (ranks over various fields, spectrum, Smith normal forms, etc.) of their corresponding matrices. In this talk, we will look at some successful examples of this approach; some examples are old, and some are new. In particular, we will talk about the recent bounds on the size of partial spreads of $H(2d - 1, q^2)$ and on the size of partial ovoids of the Ree-Tits octagon.

Three Combinatorial Problems in Theoretical Computer Science

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Abstract

In recent years, some well-known combinatorial problems have found interesting applications in theoretical computer science (TCS). At the meanwhile, some new combinatorial structures arise due to need of applications in TCS. In this talk, we will talk about three combinatorial problems that arose from our own research in the last few years. These combinatorial structures include algebraic manipulation detection codes, evasive subsets, subspace design. We will survey their current status and present some open problems.

The properties of the bordered matrix of symmetric block design

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Abstract

An incidence structure consists simply of a set P of points and a set B of blocks, with a relation of incidence between points and blocks. A symmetric (v, k, λ) block design is the subject of this paper. The symmetric $(n^2 + n + 1, n + 1, 1)$ block design is a projective plane of order n. Despite much research no one has uncovered any further necessary conditions for the existence of a symmetric (v, k, λ) design apart from the equation $(v - 1)\lambda = k(k - 1)$, Schutzenberger's Theorem and the Bruck-Ryser-Chowla Theorem. For no (v, k, λ) satisfying these requirements has it been shown that a symmetric (v, k, λ) design does not exist. Projective planes of order n exist for all prime powers n (aside from $PG(2, n)$ a host of other constructions are known) but for no other n is a construction known. The first open values are $n = 10, 12, 15, 18, 20, 24, 26$ and 28. It was proved by a computer search that there does not exist any projective plane of order 10 by Lam, C.W.H., Thiel, L. and Swiercz, S. Whether there exists any projective plane of order 12 is still open. The author introduces the bordered matrix of a (v, k, λ) symmetric design and gives some new necessary conditions for the existence of the symmetric (v, k, λ) design. As their application it is easy to determine that there does not exist finite projective plane of order n if n is one of the first open values 10, 12, 15, 18, 20, 24, 26 and 28, for which the Bruck-Ryser-Chowla Theorem can not be used. For large n the new method is also valid. Also some symmetric designs are excluded by the new method.

Keywords symmetric design; the bordered matrix; finite projective plane

Tilings of Sphere by Congruent Pentagons

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Abstract

In edge-to-edge tilings of sphere by congruent polygons, the polygon must be triangle, quadrilateral or pentagon. Sommerville studied the triangular tiling in 1923, and Ueno and Agaoka completed the classification in 2002. The quadrilateral tilings of sphere are very difficult, similar to the pentagon tilings of the plane. The pentagonal tilings are relatively easier because 5 is an extreme among $3, 4, 5$.

It is easy to show that any pentagonal tiling of the sphere must have a tile, such that 4 vertices have degree 3, and the 5-th vertex has degree $3, 4, 5$. Our classification starts with tiling the neighborhood of this special tile (called 3^5-, $3^4 4$-, $3^4 5$-tiles). Then the study is further divided into three cases according to the edge length combination of the pentagon:

1. Variable edge length: a^2b^2c, a^3bc, a^3b^2.
2. Equilateral: a^5.
3. Almost equilateral: a^4b.

In the last meeting of this conference, I presented the classification when the edge length varies, and there is a 3^5-tile. Now I explain our complete classification for the variable edge length and equilateral cases, which involve not so many families. I also explain many families of tilings we discovered for the almost equilateral case.

This is a joint work with Yohji Akama of Tohoku University, and Hoiping Luk and Erxiao Wang of the Hong Kong University of Science and Technology.

On fat Hoffman graphs with smallest eigenvalue at least -3

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Abstract

In 1995, Woo and Neumaier [2] proposed to classify the fat Hoffman graphs with smallest eigenvalue at least -3 and in 2014, Jang, Koolen, Munemasa and Taniguchi [1] proved that if a Hoffman graph is fat, (-3)-saturated, indecomposable and integrally representable of norm 3 with n slim vertices, its special $(-)$-graph is A_n, $\widetilde{A}_{n-1}$, D_n or $\widetilde{D}_{n-1}$. Based on this fact, we will show how to obtain all fat, (-3)-saturated, indecomposable and integrally representable Hoffman graphs of norm 3, with a fixed number of slim vertices. (This is joint work with Jack Koolen (USTC) and Yan-Ran Li (USTC).)

References

[1] H.J. Jang, J. Koolen, A. Munemasa and T. Taniguchi, On fat Hoffman graphs with smallest eigenvalue at least -3, *Ars Math. Contemp.* **7** (2014), no. 1, 105–121

[2] R. Woo and A. Neumaier, On graphs whose smallest eigenvalue is at least $-1-\sqrt{2}$, *Linear Algebra Appl.*, **226/228** (1995), 577–591.

Enumeration of BC-subtrees of graphs

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Abstract

Topological indices have motivated a number of theoretical and applied studies in recent decades. As representative and relatively new structure-based(also called counting based) indices, the subtree number (also called ρ-index), BC-subtree number(subtrees with at least two vertices satisfying that the distance between any two leaves is even) are attracting more and more attention in recent years. The BC-subtree number index of graphs has many special and interesting properties and could provides insight and new perspective on exploring important properties of graphs, especially physicochemical properties of molecular graphs.

Although extensive work has been done on indices(such as Wiener index, Harary index, ABC index) of graphs, it seems that there are few mathematical or computational result on BC-subtree number index so far. In this talk, we will present the results known for BC-subtree number index of graphs: method

of enumerating various graphs(tree, unicyclic and edge-disjoint bicyclic graphs), results on the extremal structures that maximize or minimize the number of BC-subtrees or leaf-containing BC-subtrees, the amazing ”reverse” relationship between the Wiener index and the number of BC-subtrees. A few open problems are also proposed.

Combinatorial enumeration

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Abstract

In this talk, we shall discuss some recent results on many statistics (descents , alternating descents , exceedances,···) of several combinatorical models (Coxter groups of type A, B and D, involutions permutations, derangements permutations, Stirling permutations). We then discuss several progress on the study of derivative polynomials and Chen’s grammars. Properties of the generating polynomials, including the recurrence relation, generating function and real-rootedness are studied.

Characterize symmetric BIBDs by its 3-concurrences

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Abstract

In a symmetric balanced block design, each pair of points appears the same times. We consider the concurrences of the triples in the SBIBDs. It is shown that the 3-concurrences characterize the SBIBDs in several classes. We also give criteria to check this statement when designs are given explicitly. There are also some computational results.

On the number of inequivalent MRD codes

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Abstract

Maximum rank-distance (MRD) codes are extremal codes in the space of $m \times n$ matrices over a finite field, equipped with the rank metric. Up to generalizations, the classical examples of such codes were constructed in the 1970s and are today known as Gabidulin codes. Motivated by several recent approaches to construct MRD codes that are inequivalent to Gabidulin codes, we study the equivalence issue for Gabidulin codes themselves. This shows in particular that the family of Gabidulin codes already contains a huge subset of MRD codes that are pairwise inequivalent, provided that $2 \leq m \leq n-2$.

This is a joint-work with Kai-Uwe Schmidt.

Tight t-designs on one shell of Johnson association schemes

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Each nontrivial shell X_r of Johnson association scheme $J(v,k)$ is known to be a commutative association scheme which is the product of two smaller Johnson association schemes, where $X_r = \{x \in \binom{V}{k} : |x \cap u_0| = k - r\}$ for a fixed k-subset u_0. Our main result is that if (Y, w) is a relative t-design in $J(v,k)$ for Q-structure on p shells then the part in one shell X_r must be a weighted $(t+1-p)$-design in X_r. In particular, it is a mixed $(t-p+1)$-design in X_r if weight is constant on each shell. (The concept of t-designs in one shell of $J(v,k)$ was naturally defined and studied by Martin in the context of mixed t-designs.) The present talk will focus on the special case when $p = 1$. We will discuss the existence problems of tight 2-, 3- and 4-designs with small parameters, say $v \leq 1,000$, on one shell of Johnson association scheme $J(v,k)$.

Relative t-designs are defined not only for Q-polynomial association schemes but also for P-polynomial association schemes. Therefore it is also interesting to consider such problems on $J(v,k)$ for P-structure.

This is a joint work with Eiichi Bannai.

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