Liebe KombinatorikerInnen,

herzlich willkommen zum 27. Kolloquium über Kombinatorik, das 2008 zum sechsten Mal in Magdeburg stattfindet.

In diesem Jahr erwarten uns drei Haupt- und 74 angemeldete Kurzvorträge bei insgesamt 110 TeilnehmerInnen. Ein Kurzvortrag sollte 20 Minuten dauern plus 5 Minuten Zeit für Diskussion. Es gibt zusätzlich 5 Minuten Zeit, den Raum zu wechseln.

In diesem Jahr gibt es “nur” drei Hauptvorträge, weil wir am Samstag bereits um 15 Uhr enden wollen. Grund: Die Otto-von-Guericke-Universität verleiht an diesem Tag Herrn Prof. Dr. Martin Grötschel die Ehrendoktorwürde. Das Festkolloquium zu diesem Anlass beginnt um 16 Uhr im Gesellschaftshaus der Stadt Magdeburg. Prof. Grötschel wird einen Festvortrag halten, die Laudatio wird Prof. Dr. Peter Gritzmann übernehmen. Die Tagungsteilnehmer des Kolloquiums über Kombinatorik sind zu diesem Festakt herzlich eingeladen.

Wir bedanken uns bei der Otto-von-Guericke-Universität Magdeburg für die finanzielle und organisatorische Unterstützung dieser Tagung.

Stefan Felsner
Alexander Pott

P.S. Bis zum Samstag, 15.11. kann im Foyer der Bibliothek die Wanderausstellung *Jüdische Mathematiker in der deutschsprachigen akademischen Kultur* besucht werden.

Räume

Hauptvorträge	:	G03-315
Sektionsvorträge	:	G02-109, G02-111, G03-106, G03-214, G03-315
Tagungsbüro	:	G02-215
Bibliothek	:	Hauptbibliothek auf dem Campus
Kaffee/Tee/Erfrischungen	:	G02-215 und G02-210
Internet	:	G02-112 (bis Freitag 17 Uhr, sowie Samstag)
Foyer der Hauptbibliothek	:	Ausstellung *Jüdische Mathematiker in der deutschsprachigen akademischen Kultur*

Das Tagungsbüro ist am Freitag von 9 bis 18:00 Uhr geöffnet, am Samstag von 08:30 bis 15:00 Uhr. Die Hauptbibliothek auf dem Campus ist am Freitag von 9 bis 21 Uhr und am Samstag von 9 bis 15 Uhr geöffnet.

Das gemeinsame Abendessen ist im *Ratskeller*, Alter Markt.

Unsere Universität bietet einen drahtlosen Internetzugang an. Gastzugänge sowie CD's mit der benötigten Software sind im Tagungsbüro erhältlich.

Freitag, 14.11.2008

9:30	**Eva Maria Feichtner (Bremen)** “An invitation to tropical geometry”	(G03-315)
anschließend	*Kaffeepause*	
11:00 - 12:30	**Sektionsvorträge**	
anschließend	*Mittagspause*	
13:45 - 15:10	**Sektionsvorträge**	
15:10 - 15:30	*Kaffeepause*	
15:30 - 16:25	**Sektionsvorträge**	
16:25 - 16:45	*Kaffeepause*	
16:45 - 18:10	**Sektionsvorträge**	
19:00	*Gemeinsames Abendessen* im **Ratskeller** Alter Markt (Einlass ab 18:30).	

Samstag, 15.11.2008

8:45	**Benjamin Doerr (Saarbrücken)** “Quasirandom Rumor Spreading”	(G03-315)
anschließend	*Kaffeepause*	
10:00	**Alexander Schrijver (Amsterdam)** “Graph invariants”	(G03-315)
anschließend	*Kaffeepause*	
11:15 - 12:10	**Sektionsvorträge**	
anschließend	*Mittagspause*	
13:40 - 15:05	**Sektionsvorträge**	
16:00 - 18:00	*Ehrenpromotion Prof. Dr. Martin Grötschel* im **Gesellschaftshaus**. Die Laudatio wird von *Prof. Dr. Peter Gritzmann* gehalten.	

Kurzvorträge Freitag, 14.11.2008

Zeit	Sektion I G02-111	Sektion II G02-109	Sektion III G03-214	Sektion IV G03-315	Sektion V G03-106
11:00	**B. Langfeld 1** Making puzzles hard is not so easy	**A. Kohnert 2** Network Codes and Designs over Finite Fields	**M. Marangio 3** Verallgemeinerte Totalfärbungen von Graphen		**V. Vigh 4** Mean width of random polytopes
11:30	**H. D. Gronau 5** Orthogonal latin squares of Sudoku type	**W. Wenzel 6** Full dimensional 0/1-Polytopes giving rise to a Linear Code	**A. Levavi 7** Pegging Numbers for Various Tree Graphs		**A. Alpers 8** On an n-dimensional Instability Result for Discrete Tomography
12:00	**H. Gropp 9** Two talks in one: On Ramon Llull and on Spatial Config.	**Y. Edel 10** APN functions and dual hyperovals	**J. Böttcher 11** On the tractability of coloring semirandom graphs		**F. Fodor 12** Circumscribed random polytopes
12:25	*Mittagspause*				
13:45	**H. Harborth 13** Hamiltonicity in vertex-deleted subgraphs of hypercubes	**J. Bierbrauer 14** Planar functions, APN functions and commutative semifields	**St. Brandt 15** Dense graphs with large odd girth	**R. Walter 16** Potentially Optimal Makespan Schedules in a two Machine Environment	**M. Böhm 17** Regular antichains
14:15	**A. Peeters 18** The GrInvIn graph investigation framework	**M. Kiermaier 19** Counting Codewords in Quadratic Residue Codes	**H. M. Teichert 20** Structural properties and hamiltonicity of neighborhood graphs	**G. Jaeger 21** Effiziente Lösungsansätze für große TSP-Instanzen	**G. Koch 22** Expected number of linear extensions for posets of width two
14:45	**M. Martens 23** Separation, Dimension, and Facet Algorithms for Node Flow Polyh.	**W. Haas 24** Lower Bounds for Codes with Large Covering Radius	**H. Hàn 25** Dirac Type Theorem for Loose Hamilton Cycles in Uniform Hypergraphs	**S. Bosio 26** Combinatorial problems related to discretized dynamical systems	**S.C.M. Li 27** Characterization of Maps with Order Dimension at most 2
15:10	*Kaffeepause*				
15:30	**M. Koch 28** Reducing complexity in combinatorial construction	**I. Rauf 29** Polynomial-time Dualization of r-Exact Hypergraphs with Applications in Geometry	**E. Steffen 30** Balanced valuations and nowhere-zero flows	**M. Killat 31** Integer and fractional packings in subgraphs of sparse random graphs	**T. Rackham 32** Methods of distance-constraint precolouring
16:00	**M. Massow 33** Diametral Pairs of Linear Extensions	**A. Schürmann 34** Universally optimal and balanced spherical codes	**M. Kochol 35** Snarks With Polyhedral Embeddings in Orientable Surfaces	**R. Kutzelnigg 36** The Structure of Sparse Random Bipartite Graphs	**F. Pfender 37** Towards the 1-2-3 conjecture
16:25	*Kaffeepause*				
16:45	**M. Zelke 38** Algorithms for Streaming Graphs	**J.-Ch. Schlage-Puchta 39** Zero-sum problems in abelian groups of small rank	**N. Van Cleemput 40** Toroidal azulenoids	**A. Paffenholz 41** Quadratic Triangulations of Transportation Polytopes	
17:15	**V. Ziegler 42** Approximating optimum branchings in linear time	**M. Rusinov 43** Homomorphism Homogeneous Graphs	**C. Reiher 44** A proof of Kemnitz' conjecture	**D. Frettlöh 45** Fractal fundamental domains for planar lattices	
17:45	**F. Liers 46** A Fast Maximum Cut Algorithm For Planar Graphs	**W. A. Schmid 47** Inverse zero-sum problems	**A. Panholzer 48** Asymptotic results for the number of unsuccessful parkers in a one-way street	**I. Voigt 49** Voronoi cells of discrete point sets	

Kurzvorträge Samstag, 15.11.2008

Zeit	Sektion I G02-111	Sektion II G02-109	Sektion III G03-214	Sektion IV G03-315	Sektion V G03-106
11:15	**D. Johannsen 50** The degree-sequence of random planar maps	**G. Averkov 51** Minimal representations of semi-algebraic sets: New constructive results	**J. Lehmann 52** Equivariant closure operators and trisp closure maps	**E. H.-A. Gerbracht 53** On the unit distance embeddability of connected cubic symmetric graphs	**C. Lange 54** Isometry classes of generalized associahedra
11:45	**Y. Person 55** On colorings of hypergraphs without monochromatic Fano planes	**B. Nill 56** Lattice width directions and Minkowski's 3^d-theorem	**M. Joswig 57** Foldable triangulations and real roots of polynomial systems	**M. Schacht 58** Hypergraph regularity and quasi-randomness	**F. Lutz 59** f-Vectors of 3-Manifolds
12:10	*Mittagspause*				
13:40	**M. Künnemann60** Experimental Results On Randomized Rumour Spreading	**T. Kalinowski 61** A dual of the binary rectangular segmentation problem	**B. Peis 62** An order-based approach to solve some combinatorial linear programs	**F. Salazar 63** Single-Source Min-Cost Flow Problem	**F. Effenberger 64** Hamiltonian submanifolds of the sporadic convex regular 4-polytopes
14:10	**A. Huber 65** Tight Bounds for Quasirandom Rumor Spreading	**M. Dörnfelder 66** On the Maximum Number of Switching Parameters for the Penality Method	**A. Pecher 67** Circular-clique polytopes and circular-perfect graphs	**S. Kurz 68** Regular matchstick graphs	**T. Ueckerdt 69** How to Eat $\frac{4}{9}$ of a Pizza
14:40	**M. Theile 70** Evolutionary Algorithms and the Travelling Salesperson Problem	**J. Foniok 71** Splitting maximal antichains in the homomorphism order	**Ch. Wagner 72** Circular-imperfection of triangle-free planar graphs	**P. Schweitzer 73** The Incompressibility Method and Lovász' Local Lemma	**P. Östergård 74** On the minimum size of 4-uniform hypergraphs without property B

Hauptvorträge

Benjamin Doerr (Saarbrücken)	: Quasirandom Rumor Spreading
Alexander Schrijver (Amsterdam)	: Graph invariants
Eva Maria Feichtner (Bremen)	: An invitation to tropical geometry

Kurzvorträge

Andreas Alpers (Lyngby)	: On an n-dimensional Instability Result for Discrete Tomography
Gennadiy Averkov (Magdeburg)	: Minimal representations of semi-algebraic sets: New constructive results
Jürgen Bierbrauer (Houghton)	: Planar functions, APN functions and commutative semifields in odd characteristic
Matthias Böhm (Rostock)	: Regular antichains
Sandro Bosio (Magdeburg)	: Combinatorial problems related to discretized dynamical systems
Julia Böttcher (München)	: On the tractability of coloring semirandom graphs
Stephan Brandt (Ilmenau)	: Dense graphs with large odd girth
Martin Dörnfelder (Jena)	: On the Maximum Number of Switching Parameters for the Penality Method
Yves Edel (Ghent)	: APN functions and dual hyperovals
Felix Effenberger (Stuttgart)	: Hamiltonian submanifolds of the sporadic convex regular 4-polytopes
Ferenc Fodor (Szeged)	: Circumscribed random polytopes
Jan Foniok (Zürich)	: Splitting maximal antichains in the homomorphism order
Dirk Frettlöh (Bielefeld)	: Fractal fundamental domains for planar lattices
Eberhard H.-A. Gerbracht (Gifhorn)	: On the unit distance embeddability of connected cubic symmetric graphs
Hans-Dietrich Gronau (Rostock)	: Orthogonal latin squares of Sudoku type
Harald Gropp (Heidelberg)	: Two talks in one: On Ramon Llull and on Spatial Configurations
Wolfgang Haas (Freiburg)	: Lower Bounds for Codes with Large Covering Radius
Hiệp Hàn (Berlin)	: Dirac Type Theorem for Loose Hamilton Cycles in Uniform Hypergraphs
Heiko Harborth (Braunschweig)	: Hamiltonicity in vertex-deleted subgraphs of hypercubes
Anna Huber (Saarbrücken)	: Tight Bounds for Quasirandom Rumor Spreading
Gerold Jaeger (Halle)	: Effiziente Lösungsansätze für große TSP-Instanzen
Daniel Johannsen (Saarbrücken)	: The degree-sequence of random planar maps
Michael Joswig (Darmstadt)	: Foldable triangulations and real roots of polynomial systems
Thomas Kalinowski (Rostock)	: A dual of the binary rectangular segmentation problem
Michael Kiermaier (Bayreuth)	: Counting Codewords in Quadratic Residue Codes
Matthias Killat (Berlin)	: Integer and fractional packings in subgraphs of sparse random graphs
Gesine Koch (Berlin)	: Expected number of linear extensions for posets of width two
Matthias Koch (Bayreuth)	: Reducing complexity in combinatorial construction
Martin Kochol (Bratislava)	: Snarks With Polyhedral Embeddings in Orientable Surfaces – a Counterexample to Grünbaum's Conjecture
Axel Kohnert (Bayreuth)	: Network Codes and Designs over Finite Fields

Marvin Künnemann (Saarbrücken)	: Experimental Results On Randomized Rumour Spreading
Sascha Kurz (Bayreuth)	: Regular matchstick graphs
Reinhard Kutzelnigg (Wien)	: The Structure of Sparse Random Bipartite Graphs
Carsten Lange (Berlin)	: Isometry classes of generalized associahedra
Barbara Langfeld (München)	: Making puzzles hard is not so easy
Juliane Lehmann (Bremen)	: Equivariant closure operators and trisp closure maps
Ariel Levavi (Saarbrücken)	: Pegging Numbers for Various Tree Graphs
Sarah Ching Man Li (Berlin)	: Characterization of Maps with Order Dimension at most 2
Frauke Liers (Köln)	: A Fast Maximum Cut Algorithm For Planar Graphs
Frank H. Lutz (Berlin)	: f-Vectors of 3-Manifolds
Massimiliano Marangio (Salzgitter)	: Verallgemeinerte Totalfärbungen von Graphen
Maren Martens (Berlin)	: Separation, Dimension, and Facet Algorithms for Node Flow Polyhedra
Mareike Massow (Berlin)	: Diametral Pairs of Linear Extensions
Benjamin Nill (Berlin)	: Lattice width directions and Minkowski's 3^d-theorem
Patric R. J. Östergård (Helsinki)	: On the minimum size of 4-uniform hypergraphs without property B
Andreas Paffenholz (Berlin)	: Quadratic Triangulations of Transportation Polytopes
Alois Panholzer (Wien)	: Asymptotic results for the number of unsuccessful parkers in a one-way street
Arnaud Pêcher (Bordeaux)	: Circular-clique polytopes and circular-perfect graphs
Adriaan Peeters (Ghent)	: The GrInvIn graph investigation framework
Britta Peis (Berlin)	: An order-based approach to solve some combinatorial linear programs
Yury Person (Berlin)	: On colorings of hypergraphs without monochromatic Fano planes
Florian Pfender (Rostock)	: Towards the 1-2-3 conjecture
Tom Rackham (Oxford)	: Methods of distance-constraint precolouring
Imran Rauf (Saarbrücken)	: Polynomial-time Dualization of r-Exact Hypergraphs with Applications in Geometry
Christian Reiher (Rostock)	: A proof of Kemnitz' conjecture
Momchill Rusinov (Saarbrücken)	: Homomorphism Homogeneous Graphs
Fernanda Salazar (Berlin)	: Single-Source Min-Cost Flow Problem
Mathias Schacht (Berlin)	: Hypergraph regularity and quasi-randomness
Jan-Christoph Schlage-Puchta (Freiburg)	: Zero-sum problems in abelian groups of small rank
Wolfgang Schmid (Graz)	: Inverse zero-sum problems
Achill Schürmann (Magdeburg)	: Universally optimal and balanced spherical codes
Pascal Schweitzer (Saarbrücken)	: The Incompressibility Method and Lovász' Local Lemma
Eckhard Steffen (Paderborn)	: Balanced valuations and nowhere-zero flows
Hanns-Martin Teichert (Lübeck)	: Structural properties and hamiltonicity of neighborhood graphs
Madeleine Theile (Berlin)	: Evolutionary Algorithms and the Travelling Salesperson Problem
Torsten Ueckerdt (Berlin)	: How to Eat $\frac{4}{9}$ of a Pizza
Nico Van Cleemput (Ghent)	: Toroidal azulenoids
Viktor Vigh (Szeged)	: Mean width of random polytopes
Ina Voigt (Dortmund)	: Voronoi cells of discrete point sets
Christian Wagner (Magdeburg)	: Circular-imperfection of triangle-free planar graphs
Rico Walter (Jena)	: Potentially Optimal Makespan Schedules in a two Machine Environment
Walter Wenzel (Bielefeld)	: Full dimensional 0/1-Polytopes giving rise to a Linear Code
Mariano Zelke (Berlin)	: Algorithms for Streaming Graphs
Valentin Ziegler (Berlin)	: Approximating optimum branchings in linear time

Weitere TeilnehmerInnen

Mais Alkahateeb (Freiberg), Christian Bey (Magdeburg), Jens.-P. Bode (Braunschweig), Stephan Matos Camacho (Freiberg), Klaus Dohmen (Mittweida), Nico Düvelmeyer (München), Stefan Felsner (Berlin), Dieter Gernert (München), Faruk Göluglu (Magdeburg), Egbert Harzheim (Köln), Aiso Heinze (Kiel), Daniel Heldt (Berlin), Franz Hering (Dortmund), Christoph Hering (Tübingen), Barbara Jablonska (Berlin), Christoph Josten (Frankfurt), Petteri Kaski (Helsinki), Arnfried Kemnitz (Braunschweig), Maria Koch (Freiberg), Kaie Kubjas (Berlin), Gohar Kyureghyan (Magdeburg), Emerson Leon (Berlin), Inna Lukyanenko (Berlin), Silke Möser (Darmstadt), Ugo Pietropaoli (Rom), Alexander Pott (Magdeburg), Astrid Reifegerste (Magdeburg), Guido Schäfer (Berlin), Anika Schwarz (Hildesheim), Martin Sonntag (Freiberg), Björn Walker (Bremen), Kay Wittig (Freiberg), Johannes Zwanzger (Bayreuth).

Freitag, 14.11.2008 — Zeit: 09:30 — G03-315

An invitation to tropical geometry

EVA MARIA FEICHTNER (Bremen)

Tropical geometry is an emerging field on the borderline of many disciplines, notably of algebra, geometry and combinatorics. One distinctive feature of tropical geometry is the translation of algebraic-geometric objects to discrete-geometric ones, whereas much of the original algebraic-geometric information is retained. The study of the resulting combinatorial data has the potential to provide new insights in geometric problems.
I will adopt the combinatorial viewpoint on the subject for a brief introduction and survey some results for which the understanding of discrete structure plays a crucial role.

This talk is based on joint work with Alicia Dickenstein and Bernd Sturmfels.

Freitag, 15.11.2008 — Zeit: 08:45 — G03-315

Quasirandom Rumor Spreading

BENJAMIN DOERR (Saarbrücken)

The “randomized rumor spreading” problem is the following. Given are a finite graph and one of its vertices, which knows a rumor unknown to the other vertices. The rumor is spread in the following manner: In each round, each vertex knowing the rumor contacts a randomly chosen neighbor, which then learns the rumor (provided it did not already know it). How many rounds are necessary to inform all vertices?

Motivated both by the beautiful concept of quasirandomness, in particular, Jim Propp’s rotor router model, or the application of such protocols to synchronize distributed databases, we suggest the following variant. Here, each vertex has a cyclic list of its neighbors. Once informed, vertices inform their neighbors in the order of the list, but starting at a random position.

Among other advantages, this approach has the nice property that you never contact a neighbor twice before having contacted all other neighbors. However, one could be afraid that the reduced use of independent randomness may lead to problems, either by actually increasing the time needed to spread the rumor, at least for unlucky choices of the cyclic lists, or by causing difficulties to prove sharp bounds.

Surprisingly, all this does not happen. In the talk, I shall present some recent results jointly obtained with Tobias Friedrich, Anna Huber, Marvin Künnemann, and Thomas Sauerwald.

Samstag, 15.11.2008 — Zeit: 10:00 — G03-315

Graph invariants

ALEXANDER SCHRIJVER (Amsterdam)

Graph invariants that are defined by partition functions or by counting homomorphisms can be characterized by the positive semidefiniteness of related matrices. We give an introduction to the results and methods.

This is joint work with Laszlo Lovász.

Freitag, 14.11.2008 — Zeit: 11:00

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1 — Sektion I — G02-111 — 11:00

Making puzzles hard is not so easy

BARBARA LANGFELD (München)

On a long train ride from Munich to Magdeburg you want to pose the following puzzle to the bored fellow passenger next to you: Given the row and column sums of your favourite 0-1-matrix A she should reconstruct A. In general, there might be several matrices sharing their row and column sums with A. So, in order to make the solution to your puzzle unique, you will have to give additional 'hints', e.g. to reveal some 0- and 1-positions in A. To make your fellow passenger's life hard, you want to reveal as few positions as possible. It turns out that finding the minimal number of such 'hints' is $\mathbb{NP}$-hard. In our talk we will sketch a proof of this result which uses a beautiful method of Alon for showing that the minimum feedback arc set problem is intractable on tournaments. This journey will also lead us to a more serious motivation of the puzzle mentioned above in the context of Discrete Tomography and in the context of polytopes and their fixing numbers.

This is joint work with Peter Gritzmann.

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2 — Sektion II — G02-109 — 11:00

Network Codes and Designs over Finite Fields

AXEL KOHNERT (Bayreuth)

There is an increased interest in designs over finite fields (i.e. collection of subspaces with special intersection properties) because of a paper by Kötter and Kschischang (ISIT conference 2007). There they showed how such designs can be used for error correction in network coding theory.
We constructed such q-analogues of classical designs and got this way new codes with more codewords than previously known ones.
In this talk I will explain the connection between network coding and designs over finite fields and will show how we constructed these new codes.

This is joint work with Sascha Kurz.

3 — Sektion III — G03-214 — 11:00

Verallgemeinerte Totalfärbungen von Graphen

MASSIMILIANO MARANGIO (Salzgitter)

$\mathcal{P}$ und $\mathcal{Q}$ seien zwei *additive vererbbare Eigenschaften* von Graphen, d.h. Klassen schlichter Graphen, die unter Vereinigungen, Teilgraphen und Isomorphismen abgeschlossen ist. Eine $(\mathcal{P}, \mathcal{Q})$*-Totalfärbung* von G ist eine Färbung der Knoten $V(G)$ und Kanten $E(G)$ von G, so dass für jede Farbe i die mit i gefärbten Knoten einen Teilgraphen mit Eigenschaft $\mathcal{P}$ induzieren, die mit i gefärbten Kanten einen Teilgraphen mit Eigenschaft $\mathcal{Q}$ induzieren und zusätzlich Knoten und inzidente Kanten verschieden gefärbt sind. Die $(\mathcal{P}, \mathcal{Q})$*-totalchromatische Zahl* $\chi''_{\mathcal{P},\mathcal{Q}}(G)$ ist die kleinste Anzahl Farben, die in einer solchen Färbung benötigt wird.

In diesem Vortrag werden einfache allgemeine Ergebnisse über $(\mathcal{P}, \mathcal{Q})$-Totalfärbungen vorgestellt. Es werden die $(\mathcal{P}, \mathcal{Q})$-totalchromatischen Zahlen von Wegen und Kreisen und für spezielle Eigenschaften die $(\mathcal{P}, \mathcal{Q})$-totalchromatischen Zahlen weiterer Graphenklassen bestimmt.

Gemeinsame Arbeit mit M. Borowiecki, A. Kemnitz und P. Mihók.

4 — Sektion V — G03-106 — 11:00

Mean width of random polytopes

VIKTOR VIGH (Szeged)

Let K be a convex body in $\mathbf{R}^d$ and $X_n = (x_1, \ldots, x_n)$ a random sample of n independent points in K chosen according to the uniform distribution. The convex hull K_n of X_n is a random polytope inscribed in K. In this talk we show recent asymptotical results on the mean width of K_n with the assumption that K has a rolling ball. Furthermore, we show that the discussed asymptotic results are optimal in the sense that the conditions cannot be weakened considerably.

This is joint work with K. J. Böröczky, F. Fodor and M. Reitzner.

Freitag, 14.11.2008 — Zeit: 11:30

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5 — Sektion I — G02-111 — 11:30

Orthogonal latin squares of Sudoku type

HANS-DIETRICH GRONAU (Rostock)

A first example of a pair of orthogonal latin squares of Sudoku type (a pair of Sudokus which form a pair of orthogonal latin squares) was created by P. Vaderlind. In the talk we present several results on the maximal number of mutually orthogonal latin squares of Sudoku type.

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6 — Sektion II — G02-109 — 11:30

Full dimensional 0/1-Polytopes giving rise to a Linear Code

WALTER WENZEL (Bielefeld)

We study *Marginal Polytopes* which are certain 0/1-polytopes associated in a canonical way to Hierarchical Models. To the algebraic geometers, these polytopes are familiar as the polytopes associated to toric varieties. To the statisticians, they are familiar as the polytopes of expectation values for certain observables. It turns out that the marginal polytopes can be realized as full dimensional polytopes in such a way that their vertices exhibit a group structure. We describe an algorithm that classifies all 0/1-polytopes having these two properties.

This is joint work with Nihat Ay and Thomas Kahle, Leipzig.

7 — Sektion III — G03-214 — 11:30

Pegging Numbers for Various Tree Graphs

ARIEL LEVAVI (Saarbrücken)

In the game of pegging, each vertex of a graph is considered a hole into which a peg can be placed. A pegging move is performed by jumping one peg over another peg, and then removing the peg that has been jumped over from the graph. We define the pegging number as the smallest number of pegs needed to reach all the vertices in a graph no matter what the distribution. Similarly, the optimal-pegging number of a graph is defined as the smallest distribution of pegs for which all the vertices in the graph can be reached. We obtain tight bounds on the pegging numbers and optimal-pegging numbers of complete binary trees and compute the optimal-pegging numbers of complete infinitary trees. As a result of these computations, we deduce that there is a tree whose optimal-pegging number is strictly increased by removing a leaf. We also compute the optimal-pegging number of caterpillar graphs and the tightest upper bound on the optimal-pegging numbers of lobster graphs.

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8 — Sektion V — G03-106 — 11:30

On an n-dimensional Instability Result for Discrete Tomography

ANDREAS ALPERS (Lyngby)

The main task in *Discrete Tomography* is to reconstruct finite lattice sets that are only accessible from their line sums taken along a small number of directions. It is well known that small perturbations of the line sums can lead to reconstructions that differ from the original set. But affine similarities between such sets suggest that at least geometrical information could be recovered. This, however, is not the case. In this talk we give an elementary proof of the fact that for any set of $m \geq 3$ directions in $\mathbb{Z}^d$, $d \geq 2$, there are arbitrarily large lattice sets F_1 and F_2 with almost equal line sums (in these directions) and low affine similarity. Our arguments are based on combinatorial representations of F_1 and F_2, which are obtained using methods from multilinear algebra.

This is joint work with Peter Gritzmann.

Freitag, 14.11.2008 — Zeit: 12:00

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9 — Sektion I — G02-111 — 12:00

Two talks in one: On Ramon Llull and on Spatial Configurations

HARALD GROPP (Heidelberg)

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10 — Sektion II — G02-109 — 12:00

APN functions and dual hyperovals

YVES EDEL (Ghent)

A function $f : \mathbb{F}_{2^n} \mapsto \mathbb{F}_{2^n}$ is called almost perfect nonlinear (APN) iff for all $a \in \mathbb{F}_{2^n}^*$ and $b \in \mathbb{F}_{2^n}$ the equation $f(x+a) - f(x) = b$ has at most two solutions. APN functions have interesting links to finite geometry [1, 2].
We show how to construct quadratic APN functions from certain types of dual hyperovals. This provides the opposite direction of the construction used in [2] and gives a one-to-one correspondence between extended affine equivalence classes of quadratic APN functions and equivalence classes of these dual hyperovals.

References

[1] F. Göloglu, A. Pott , Almost Perfect Nonlinear Functions: A possible geometric approach. Proceedings of the contact forum Coding Theory and Cryptography II. Royal Flemish Academy of Belgium for Science and the Arts, 2008.

[2] S. Yoshiara, Dimensional dual hyperovals associated with quadratic APN functions. IIG to appear.

11 — Sektion III — G03-214 — 12:00

On the tractability of coloring semirandom graphs

JULIA BÖTTCHER (München)

As part of the efforts put in understanding the intricacies of the k-colorability problem, different distributions over k-colorable graphs were analyzed. While the k-colorability problem is notoriously hard (not even reasonably approximable) in the worst case, developing polynomial algorithms for the average case (with respect to such distributions) often turns out to be easy. Semi-random models mediate between these two extremes and are more suitable to imitate "real-life" instances than purely random models. In this work we consider different examples of such models: we study semi-random variants of the planted k-colorability distribution and prove tractability or hardness results for them. This continues a line of research pursued by Coja-Oghlan and by Krivelevich and Vilenchik. As in these earlier works, our methods partly rely on semidefinite programming.
In the talk I will introduce the relevant concepts, give an overview about previous work in the area and present our new results. I will also explain the role that semidefinite programming plays for the algorithms developed for solving this problem.

This is joint work with Dan Vilenchik.

12 — Sektion V — G03-106 — 12:00

Circumscribed random polytopes

FERENC FODOR (Szeged)

Most of the results on random polytopes deal with inscribed polytopes, that is, polytopes that arise as the convex hull of random points in a convex body K. In this talk, we consider the dual problem where a random polyhedral set is generated as the intersection of random closed halfspaces containing a convex body K. We shall concentrate on the mean width of circumscribed random polytopes and state some new asymptotic results and describe open problems.

This work is joint with K. J. Böröczky and D. Hug.

Freitag, 14.11.2008 — Zeit: 13:45

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13 — Sektion I — G02-111 — 13:45

Hamiltonicity in vertex-deleted subgraphs of hypercubes

HEIKO HARBORTH (Braunschweig)

It is asked for sets of vertices being deleted from the hypercube Q_n such that in the remaining subgraph of Q_n there always exist (1) a hamiltonian cycle and (2) hamiltonian paths between pairs of vertices. - Partial results with up to 6 deleted vertices for (1) and with up to 2 deleted vertices for (2) are presented.

This is joint work with Arnfried Kemnitz.

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14 — Sektion II — G02-109 — 13:45

Planar functions, APN functions and commutative semifields in odd characteristic

JÜRGEN BIERBRAUER (Houghton)

In the theory of functions with maximal nonlinearity there is a sharp dichotomy between the odd characteristic and characteristic 2 cases. In characteristic two the motivation comes from cryptography (theory of S-boxes) whereas in odd characteristic there is a strong link to geometry (planar functions, commutative semifield translation planes). The relation between the semifield product and the planar (PN) function is completely analogous to the relation between bilinear forms and quadratic forms in odd characteristic.
We present (see [BierPN]) a uniform construction method for a large class of APN/PN functions in all characteristics (for the characteristic 2 case see [crookfamily]). The semifields are constructed as cubic or biquadratic extensions. The cubic cases (see [ZKW]) as well as the biquadratic examples in characteristic two had been considered earlier by various authors. We describe a large parametric family in the biquadratic case. The corresponding planar functions are

$$f(x) = x^{1+q'} - vx^{q^3+qq'} \text{ defined on } GF(q^4)$$

where $q = p^s, q' = p^t, 2s/\gcd(2s, d)$ odd and $ord(v) = (q^4 - 1)/(q - 1)$.
It is shown that the subcase of orders p^{4s} for odd $s > 1$ yields new planar functions. In the case of order p^{12} the middle nucleus has order p^2, the kernel has order p.

References

[BierPN] J. Bierbrauer: *New semifields, PN and APN functions,* submitted for publication in *Designs, codes and cryptography.*

[crookfamily] J. Bierbrauer: *A family of crooked functions, Designs, Codes and Cryptography,* to appear.

[ZKW] Z. Zha, G.M. Kyureghyan, X. Wang: *Perfect nonlinear binomials and their semifields,* manuscript.

15 — Sektion III — G03-214 — 13:45

Dense graphs with large odd girth

STEPHAN BRANDT (Ilmenau)

Generalizing a result of Häggkvist and Jin for the case $k = 3$ to arbitrary k, we show that every graph of order n with odd girth at least $2k+1$ and minimum degree $\delta \geq 3n/4k$ is either homomorphic with C_{2k+1} or can be obtained from the Möbius ladder with $2k$ spokes by vertex duplications. In the case $k = 3$ we can prove the next step, showing that every graph with odd girth 7 and minimum degree $\delta > \frac{4n}{17}$ is homomorphic with the Möbius ladder with 6 spokes.

This is joint work with Elizabeth Ribe-Baumann (Ilmenau)

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16 — Sektion IV — G03-315 — 13:45

Potentially Optimal Makespan Schedules in a two Machine Environment

RICO WALTER (Jena)

We consider the following job scheduling scenario. Given a set of n jobs that have to be processed on two identical machines. The objective is to find an assignment of the jobs to the machines that minimizes the makespan, which is the maximum completion time of the machines. We assume that any two jobs have different, positive processing times.
For the above mentioned scenario we will give a total characterization of the set of potentially optimal makespan schedules. For each schedule of this set feasible processing times exist, which let the schedule be optimal.

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17 — Sektion V — G03-106 — 13:45

Regular antichains

MATTHIAS BÖHM (Rostock)

Let $\mathcal{B}$ be a subset of $\mathcal{P}([n])$, the power set of $[n] := \{1, 2, \ldots, n\}$. The size of $\mathcal{B}$ is $m := |\mathcal{B}|$. We call $\mathcal{B}$ an antichain if there are no two sets in $\mathcal{B}$ which are comparable under set inclusion. An antichain $\mathcal{B}$ is called k-regular ($k \in \mathbb{N}$), if for each $i \in [n]$ there are exactly k blocks $B_{j_1}, B_{j_2}, \ldots, B_{j_k} \in \mathcal{B}$ containing i. In this case we say that $\mathcal{B}$ is a (k, n, m)-antichain.
We analyse if for a given parameter-pair (n, m) an (n, n, m)-antichain exists or not. Our main result is a sufficient condition: Let $n, m \in \mathbb{N}$ arbitrary with $n \geq 6$ and with

$$\begin{cases} n+3 \leq m \leq \left\lfloor \binom{n}{2} - \frac{2}{5}n \right\rfloor & \text{if} \quad n \equiv 0,1,3,4,6,8,9 \mod 10, \\ n+3 \leq m \leq \left\lfloor \binom{n}{2} - \frac{2}{5}n \right\rfloor - 1 & \text{if} \quad n \equiv 2,5,7 \mod 10. \end{cases}$$

Then there exists an (n, n, m)-antichain $\mathcal{B}$.

Freitag, 14.11.2008 — Zeit: 14:15

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18 — Sektion I — G02-111 — 14:15

The GrInvIn graph investigation framework

ADRIAAN PEETERS (Ghent)

GrInvIn[1] (Graph Invariant Investigator) is a software package for studying graphs, their properties (invariants) and the relations between them. The main purpose of this framework, which is partly inspired on Graffiti.pc[2], is to use a form of data mining to derive new conjectures based on invariant values computed for a given set of graphs. It has applications in research and teaching and is (planned to be) used at Universität Paderborn, Germany and in the DisWis II course of De Praktijk, The Netherlands. A lot of effort has been put in the software design of the framework. It has been designed to be open, allowing the integration of existing and/or external tools, such as new invariant computing algorithms, through simple plug-ins.

[1] PEETERS, A., COOLSAET, K., BRINKMANN, G., VAN CLEEMPUT, N., AND FACK, V. GrInvIn in a nutshell. *Journal of Mathematical Chemistry*, to appear.

[2] DELAVINA, E. Graffiti.pc: A Variant of Graffiti. In *Graphs and Discovery*, volume 69 of *Series in Discrete Mathematics and Theoretical Computer Science*, pages 71–79, Rhode Island, 2005. American Mathematical Society.

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19 — Sektion II — G02-109 — 14:15

Counting Codewords in Quadratic Residue Codes

MICHAEL KIERMAIER (Bayreuth)

By the Gleason-Prange-Theorem, the extended binary quadratic residue codes (QR-codes) of length $p+1$ contain a subgroup $G \cong \mathrm{PSL}(2,p)$. In the case $p \equiv -1 \pmod 8$, it is well-known that G operates 3-homogeneous on the positions, so the codewords of fixed weight form a 3-design. This fact was used by Chong-Dao Lee, Yaotsu Chang and Trieu-Kien Truong to show that for $p \equiv -1 \pmod 8$, the weight enumerator of a binary QR-code is completely determined by the weight enumerator of a certain code of one eighth of the original size. In a second article, they proved that the same is true for the other case $p \equiv +1 \pmod 8$. We will discuss an alternative proof using finite group actions. Furthermore, we generalize this method to QR-codes over $\mathbb{Z}_4$. As a result, we were able to compute some new weight enumerators of $\mathbb{Z}_4$-linear QR-codes.

20 — Sektion III — G03-214 — 14:15

Structural properties and hamiltonicity of neighborhood graphs

HANNS-MARTIN TEICHERT (Lübeck)

Let $G = (V, E)$ be an undirected graph. $N(G) = (V, E_N)$ is the *neighborhood graph* of the graph G, if and only if $E_N = \{\{a, b\} \mid \exists x \in V : \{x, a\} \in E \wedge \{x, b\} \in E\}$. In the first part of discuss several structural properties; particularly we show that $N(G)$ of a nonbipartite, 2-connected graph G has this property too. In the second part we investigate hamiltonicity and discuss two approaches: Firstly, which sufficient conditions for the hamiltonicity of G guarantee the hamiltonicity of $N(G)$? Secondly, which types of chords of a hamiltonian cycle in G imply the hamiltonicity of $N(G)$?

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21 — Sektion IV — G03-315 — 14:15

Effiziente Lösungsansätze für große TSP-Instanzen

GEROLD JAEGER (Halle)

Das Traveling Salesman Problem ist das NP-schwere Problem, in einem Graphen eine kürzeste geschlossene Tour zu finden, die jeden Knoten genau einmal besucht. Für Instanzen mit großer Knotenzahl ist eine exakte Lösung oft nicht möglich, so dass man sich mit einer guten heuristischen Lösung zufriedengibt. Für solche Instanzen entwickeln wir eine Reduktionstechnik, die die gegebene Instanz in eine Instanz mit deutlich kleinerer Knotenzahl transformiert. Dazu wird vor dieser Transformation schon eine Menge von guten Touren gesucht und die Kanten, die in allen dieser Touren enthalten sind, werden fixiert und Pfade von mehreren fixierten Kanten zu einer Kante kontrahiert. Touren der reduzierten Instanz können in einfacher Weise in eine Tour der originalen Instanz zurücktransformiert werden. Die Reduktion der Knotenzahl führt dazu, dass der entscheidende Teil des Suchraums besser durchsucht werden kann, während Tourkanten, die sich als gut herausgestellt haben, schon fixiert sind. Auf die reduzierte Instanz können nun Standardheuristiken, wie die derzeit führende Helsgaun-Heuristik, angewandt werden. Mit der vorgestellten Methode ist es gelungen, für 7 Benchmark-Instanzen der Klasse VLSI von der TSP-Homepage Rekordtouren zu finden, von denen 5 Rekordtouren immer noch aktuell sind.

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22 — Sektion V — G03-106 — 14:15

Expected number of linear extensions for posets of width two

GESINE KOCH (Berlin)

We consider partially ordered sets of width two given by two chains. The linear extensions of such a poset are regarded as lattice paths in a two-dimensional lattice. The relations between the chains correspond to certain boundaries of the lattice and the number of lattice paths that stay within the boundaries corresponds to the number of linear extensions of the poset. Given only the *number* of relations between the chains, we ask for the expected number of linear extensions. We prove a generalization of the well-known Catalan-formula to lattices that are not necessarily quadratic and where we have an arbitrary boundary path instead of the diagonal in the Catalan-case. We conjecture that the formula remains valid even upon addition of a second boundary path. This conjecture can be proven for some special cases.

Freitag, 14.11.2008 — Zeit: 14:45

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23 — Sektion I — G02-111 — 14:45

Separation, Dimension, and Facet Algorithms for Node Flow Polyhedra

MAREN MARTENS (Berlin)

Given a directed acyclic graph with sources and sinks, consider the set of flows induced by putting non-negative flows on all source-sink paths. The flow through a node is the sum of the flows on all paths containing it. When the number of paths is much larger than the number of nodes, it is more convenient to consider the set of node flows in place of that of path flows. Ball et al. found characterizations of the set of node flows for some special cases. We extend this work in various directions: we allow arbitrary directed networks, we allow both upper and lower bounds on flows, we characterize which valid inequalities are facets, we give fast algorithms for separation, validity, and dimension, and we put all the pieces together into an algorithm for separating to a facet. All algorithms are very efficient, as they are based on max flow and min-cost flow subroutines.

This is joint work with S. Thomas McCormick and Maurice Queyranne, University of British Columbia, Sauder School of Business, 2053 Main Mall, Vancouver, BC, V6T 1Z2, Canada.

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24 — Sektion II — G02-109 — 14:45

Lower Bounds for Codes with Large Covering Radius

WOLFGANG HAAS (Freiburg)

Let $K_q(n,R)$ denote the minimal cardinality of a q-ary code of length n and covering radius R. Recently the authors gave a new proof of a classical lower bound of Rodemich on $K_q(n,n-2)$ from 1970. In this talk we demonstrate that, in contrast to Rodemich's original proof, the method generalizes to lower-bound $K_q(n,n-k)$ for any $k > 2$. The approach is best-understood, if we consider a game between an opponent and us. The opponent successively offers us partitions of a set A and we choose a set from each partition, trying to achieve, that every element of A occurs less than a given number of times in our chosen sets. We have to compute winning strategies for us, since that means, that a certain covering code does not exist. This proves to be by far the most efficient method presently known to lower-bound $K_q(n,R)$ for large R (i.e. small k). One instance: the trivial sphere-covering bound $K_{12}(7,3) \geq 729$, the previously best bound $K_{12}(7,3) \geq 732$ and the new bound $K_{12}(7,3) \geq 878$.

This is joint work with Immanuel Halupczok (Paris) and Jan-Christoph Schlage-Puchta (Freiburg).

25 — Sektion III — G03-214 — 14:45

Dirac Type Theorem for Loose Hamilton Cycles in Uniform Hypergraphs

HIỆP HÀN (Berlin)

As a generalisation, we say a cycle in a k-uniform hypergraph is ℓ-Hamiltonian if it covers all vertices and every two consecutive edges intersect in exactly ℓ vertices. In this talk we prove a Dirac type theorem for the existence of loose Hamiltonian cycles, i.e. ℓ-Hamiltonian cycles with $\ell < k/2$. More precisely, we show that for all $\ell < k/2$ and all $\gamma > 0$ there is an n_0 such that for all $n > n_0$ the following holds: Every k-uniform n-vertex hypergraph H with minimum $(k-1)$-degree at least $\left(\frac{1}{2(k-\ell)} + \gamma\right) n$ contains an ℓ-Hamiltonian cycle. This result is best possible up to the error term γ.

This is joint work with Mathias Schacht

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26 — Sektion IV — G03-315 — 14:45

Combinatorial problems related to discretized dynamical systems

SANDRO BOSIO (Magdeburg)

Dynamical systems are typically modeled as a system of differential equations $\dot{x} = f(x,p)$ describing the evolution of a state vector $x(t) \in X \subseteq \mathbb{R}^n$ for a given a parameter vector $p \in P \subseteq \mathbb{R}^m$. With an appropriate space and time discretization, the evolution of the system can be described by means of a layered graph. Each node of the graph represents a region of the state space at a given time, and to each arc (i,j) is associated a subset $P_{ij} \subseteq P$ of parameters, which is the set of parameters allowing the transition from some point in the region associated to i to some point in the region associated to j. Given an $s-t$ path in this graph, we say that the path is *feasible* if the intersection of the subsets P_{ij} associated to the arcs (i,j) of the paths is nonempty. The existence of a feasible path is a necessary (though not sufficient) condition for the existence of a trajectory in the state space of the original dynamical system. We consider some combinatorial problems focusing on feasible paths, considering different assumptions on the sets P_{ij}. The resulting problems arise in the context of Model Invalidation, Parameter Identification, and Experimental Design.

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27 — Sektion V — G03-106 — 14:45

Characterization of Maps with Order Dimension at most 2

SARAH CHING MAN LI (Berlin)

We consider the poset P_M formed by taking the vertices, edges and faces of a map M, ordered by inclusion. It is well known that the order dimension of P_M is at most 4 if M is a planar map. With this result, we aim to characterize maps M such that P_M has order dimension at most 2. We construct a list of “forbidden structures”, and show that a map M and its dual map M^* having none of the forbidden structures is a necessary and sufficient condition for poset P_M to have order dimension at most 2.

Freitag, 14.11.2008 — Zeit: 15:30

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28 — Sektion I — G02-111 — 15:30

Reducing complexity in combinatorial construction

MATTHIAS KOCH (Bayreuth)

We present a new method between depth-first-search and breadth-first-search to reduce the complexity in combinatorial construction. This approach can be applied to a wide range of combinatorial problems and is demonstrated on the example of arc searching in finite geometries.

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29 — Sektion II — G02-109 — 15:30

Polynomial-time Dualization of r-Exact Hypergraphs with Applications in Geometry

IMRAN RAUF (Saarbrücken)

Let $\mathcal{H} \subseteq 2^V$ be a hypergraph on vertex set V. For a positive integer r, we call $\mathcal{H}$ r-exact, if any minimal transversal of $\mathcal{H}$ intersects any hyperedge of $\mathcal{H}$ in at most r vertices.This class includes several interesting examples from geometry, e.g., circular-arc hypergraphs ($r = 2$), hypergraphs defined by sets of axis-parallel lines stabbing a given set of α-fat objects ($r = 4\alpha$), and hypergraphs defined by sets of points contained in translates of a given cone in the plane ($r = 2$). For constant r, we give a polynomial-time algorithm for the duality testing problem of a pair of r-exact hypergraphs. This result implies that minimal hitting sets for the above geometric hypergraphs can be generated in output-sensitive polynomial time.

This is joint work with Khaled Elbassioni (Saarbrücken).

30 — Sektion III — G03-214 — 15:30

Balanced valuations and nowhere-zero flows

ECKHARD STEFFEN (Paderborn)

There are some prominent conjectures of Tutte, Jaeger and Seymour on nowhere-zero flows on graphs. In this talk we use the concept of balanced valuations to show that cyclically highly connected cubic graphs have a nowhere-zero 5-flow. Furthermore we show that almost bipartite $2l+1$-regular graphs have nowhere-zero $2+\frac{1}{k}$-flows ($l \geq k$).

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31 — Sektion IV — G03-315 — 15:30

Integer and fractional packings in subgraphs of sparse random graphs

MATTHIAS KILLAT (Berlin)

For a graph H the F-packing number $\nu_F(H)$ is the maximum number of edge disjoint copies of the graph F in H. It is well known that computing $\nu_F(H)$ is NP-hard if F contains a component with at least 3 edges. A result of Haxell and Rödl shows that $\nu_F(H)$ can be approximated by the fractional packing number $\nu_F^*(H)$ with an additive error term of order $o(n^2)$, n being the number of vertices of H. Since $\nu_F^*(H)$ can be calculated using linear programming this provides an efficient approximation algorithm for $\nu_F(H)$. However, the error term is only meaningful if H is dense, i.e. has $\Omega(n^2)$ edges, since $\nu_F^*(H)$ is bounded from above by $e(H)/e(F)$. We discuss a probabilistic version of this result for subgraphs of the binomial random graph $G(n,p)$. More precisely, we show that for $p = p(n)$ larger than a certain function $p_F(n) = o(1)$ with high probability for all subgraphs H of $G(n,p)$ the F-packing number of H can be approximated up to an error term of $o(pn^2)$. The proof is based on the application of the *sparse regularity lemma* and a result of Frankl and Rödl concerning nearly perfect matchings in uniform hypergraphs.

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32 — Sektion V — G03-106 — 15:30

Methods of distance-constraint precolouring

TOM RACKHAM (Oxford)

Let G be a simple k-colourable graph and let P be a subset of $V(G)$ of which all vertices are pairwise far apart. Under what circumstances does any k-colouring of P extend to a proper k-colouring of G? Given a family of k-colourable graphs, how much freedom is there in assigning a k-colouring? We present several methods for obtaining distance-constraint precolouring results in the context of using at most $\Delta(G)$ colours. We will discuss the question of the flexibility of list-colourings and improper-colourings of planar graphs.

Freitag, 14.11.2008 — Zeit: 16:00

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33 — Sektion I — G02-111 — 16:00

Diametral Pairs of Linear Extensions

MAREIKE MASSOW (Berlin)

Given a finite poset P, we consider pairs of linear extensions of P with maximal distance. The distance of two linear extensions L_1, L_2 is the number of pairs of elements of P appearing in different orders in L_1 and L_2. Deciding if P has two linear extensions of distance at least k is NP-complete in general, and can be solved in polynomial time for posets of width 3. A diametral pair maximizes the distance among all pairs of linear extensions of P. Felsner and Reuter conjectured that in every diametral pair at least one of the two linear extensions reverses a critical pair of P. We give a counterexample disproving this conjecture. On the other hand, we show that the conjecture holds for almost all posets. The most intriguing open question here is what diametral pairs of the Boolean Lattice look like. It has been conjecrtured that they have the structure of the reverse lexicographic order and the reverse antilexicographic order, but we can only prove this in very small dimensions.

This is joint work with Graham Brightwell.

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34 — Sektion II — G02-109 — 16:00

Universally optimal and balanced spherical codes

ACHILL SCHÜRMANN (Magdeburg)

How does one arrange a collection of points on the unit sphere so as to minimize their potential energy. Almost always the optimal configuration depends on the chosen potential function, but in certain cases it does not; Cohn and Kumar call these universally optimal spherical codes. They highlight some of the most remarkable structure in mathematics (such as the E_8 root lattice, the Leech lattice and the 27 lines on a cubic surface). In this talk we report on numerical experiments, resulting in two potentially new universal optima. We show that the list of known universal optima is complete up to dimension 3, as all universal optima have to be balanced, meaning they have to be in equilibrium under all possible force laws. Most balanced configurations seem to have some special symmetry, but to our own suprise we find remarkable balanced spherical codes in higher dimensions that do not have any symmetry.

This is joint work with Henry Cohn, Noam Elkies, Abhinav Kumar and Grigoriy Blekherman, Brandon Ballinger, Noah Giansiracusa, Elizabeth Kelly.

35 — Sektion III — G03-214 — 16:00

Snarks With Polyhedral Embeddings in Orientable Surfaces – a Counterexample to Grünbaum's Conjecture

MARTIN KOCHOL (Bratislava)

An embedding of a 3-regular graph in a surface is called *polyhedral* if its dual is a simple graph. In 1968 Grünbaum conjectured that every 3-regular graph with a polyhedral embedding in an orientable surface has a 3-edge-coloring. An affirmative solution of this problem would generalize the dual form of the Four Color Theorem for every orientable surface. In this paper we present a negative solution of the conjecture, showing that for each orientable surface of genus at least 5, there exist infinitely many 3-regular non 3-edge-colorable graphs with a polyhedral embedding in the surface.

36 — Sektion IV — G03-315 — 16:00

The Structure of Sparse Random Bipartite Graphs

REINHARD KUTZELNIGG (Wien)

Given a graph possessing two different types of vertices, we consider a growth process that successively adds edges connecting two randomly selected nodes of different kind. Similar to an "usual" random graph, no component containing more than one cycle is created with high probability, conditioned that the number of edges does not exceed a certain bound. We study properties of the obtained bipartite graph, such as the size of the tree components, the number of cycles, and the number of nodes contained in cycles resp. cyclic components. Using this results, we provide an analysis of Cuckoo Hashing, a hash table data structure closely related to this graph. Our analysis is based on a generating function approach and a double saddle point method to obtain asymptotic results.This talk is based on joint work with Michael Drmota.

37 — Sektion V — G03-106 — 16:00

Towards the 1-2-3 conjecture

FLORIAN PFENDER (Rostock)

In 2002, Karoński, Łuczak and Thomason conjectured that you can weight the edges of every connected graph on at least 3 vertices with the weights $\{1, 2, 3\}$, such that the resulting total weights at the vertices properly color the graph. The conjecture is known to be true for several classes of graphs, in particular for all graphs on up to 11 vertices and for all 3-colorable graphs. Further, in 2007 and 2008, it was shown that for any graph one can achieve such a vertex coloring edge weighting with the weights Specher$\{1, 2, ..., 30\}$, and $\{1, 2, ..., 16\}$, respectively. In this talk we show how to achieve such an edge weighting using only the weights $\{1, 2, ..., 6\}$.

This is joint work with M. Kalkowski and M. Karoński.

Freitag, 14.11.2008 — Zeit: 16:45

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38 — Sektion I — G02-111 — 16:45

Algorithms for Streaming Graphs

MARIANO ZELKE (Berlin)

The semi-streaming model forbids random access to the input graph and uses a working memory of restricted size. It was proposed by Muthukrishnan in 2003 and is appropriate when tackling huge graphs. We present algorithms with optimal running times in this model for testing graph connectivity and bipartiteness and the computation of a minimum spanning tree. Interestingly, these running times match the corresponding ones in the RAM model. For the problem of finding a maximum weighted matching, which is intractable in the semi-streaming model, we will present the best known approximation algorithm.

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39 — Sektion II — G02-109 — 16:45

Zero-sum problems in abelian groups of small rank

JAN-CHRISTOPH SCHLAGE-PUCHTA (Freiburg)

For a finite abelian group G let $D(G)$ be the least integer n, such that for each sequence $g_1, \dots, g_n$ of elements in G there exists a subseqence $i_1 \dots, i_k$, such that $g_{i_1} + g_{i_2} + \cdots + g_{i_k} = 0$. For groups of rank 2, the value of $D(G)$ is known, while for groups of rank 3, there is a plausible conjecture. To apply induction over the rank one needs good information on the structure ofsequences of maximal length, such that there exist no sub-sequence adding up to zero. We describe how one can obtain such knowledge for groups of rank 2, and what we can deduce for groups of rank 3 from it.

This is joint work with G. Bhowmik and I. Halupczok.

40 — Sektion III — G03-214 — 16:45

Toroidal azulenoids

NICO VAN CLEEMPUT (Ghent)

An azulenoid is a carbon network in which there exists a partition of the atoms into azulenes (a five ring and a seven ring share an edge) and that has the potential for interesting chemical applications. We will discuss the question what the possible forms of toroidal azulenoids - i. e. azulenoids that form a torus - with one orbit of azulenes are. This problem is equivalent to finding periodic azulenoid tilings of the plane. To enumerate and classify certain types of tilings we need a symbolic description for these tilings. Delaney-Dress symbols turned out to be a very efficient means for the prupose of enumerating periodic tilings. We will give a short introduction to these Delaney-Dress symbols and describe the methods we used to generate this specific class of tilings. Furthermore we give examples of the 1274 azulenoid tilings that were generated.

This is joint work with Gunnar Brinkmann, Olaf Delgado-Friedrichs and Edward Kirby.

41 — Sektion IV — G03-315 — 16:45

Quadratic Triangulations of Transportation Polytopes

ANDREAS PAFFENHOLZ (Berlin)

Let P be a lattice polytope. Associated to P there is a homogeneous toric ideal I_P. This ideal has a square-free initial ideal if and only if the polytope P has a regular unimodular triangulation. In that case, the initial ideal is the Stanley-Reisner ideal of the triangulation. If all minimal non-faces of this triangulation are edges (i.e. the triangulation is quadratic), then the initial ideal is generated by quadratic monomials. It is a open question, whether I_P has an initial ideal that is generated by square-free qudratic monomials, or, equivalently, whether P has a quadratic triangulation, if the variety defined by I_P is smooth.
In my talk I will prove this for a special class of polytopes. An $(n \times m)$-transportation polytope is the set of all non-negative $(m \times n)$-matrices with fixed integer row and column sums. I will explain a method that explicitely constructs a quadratic triangulation for any (3×3)-transportation polytope T_3 that is not a multiple of the Birkhoff polytope B_3 (all row and column sums 1). This includes the set of all smooth T_3.

This is joint work with Christian Haase.

Freitag, 14.11.2008 — Zeit: 17:15

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42 — Sektion I — G02-111 — 17:15

Approximating optimum branchings in linear time

VALENTIN ZIEGLER (Berlin)

Given a directed graph $G = (V, A)$, a *branching* of G is an acyclic subgraph $B = (V, A' \subset A)$, such that $|\{a|(a, v) \in A'\}| \leq 1$ for all $v \in V$. The optimization problem of finding a *maximum weight branching* in a digraph with weighted arcs can be solved in time $O(m + n \log n)$ [Gabow et al. 1986]. We prove that maximum weight branchings can be be approximated in time $O(m)$ up to a factor of $1 - \epsilon$, where $\epsilon > 0$ is an arbitrary constant.

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43 — Sektion II — G02-109 — 17:15

Homomorphism Homogeneous Graphs

MOMCHILL RUSINOV (Saarbrücken)

We answer two open question posed by Cameron and Nesetril concerning homomorphism homogeneous graphs. In particular we show, by giving a characterization of these graphs, that extendability to monomorphism or to homomorphism leads to the same class of graphs when defining homomorphism-homogeneity. Further we show that there are homomorphism homogeneous graphs that do not contain the Rado graph as a spanning subgraph answering the second open question. We also treat the case of homomorphism-homogeneous graphs with loops allowed, showing that the corresponding decision problem is co-NP complete. Finally we extend the list of considered morphism-types and show that the graphs for which monomorphisms can be extended to epimorphisms are complements of homomorphism homogeneous graphs.

44 — Sektion III — G03-214 — 17:15

A proof of Kemnitz' conjecture

CHRISTIAN REIHER (Rostock)

Given a positive integer n, we prove that any $(4n-3)$–set of planar lattice points contains an n–subset the sum of whose elements is divisible by n.

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45 — Sektion IV — G03-315 — 17:15

Fractal fundamental domains for planar lattices

DIRK FRETTLÖH (Bielefeld)

The point group of a lattice is the group of linear isometries mapping the lattice to itself. It is easy to see that any lattice has a fundamental domain (wrt to translations) which symmetry group is the point group of the lattice: just take the Voronoi cells. It is slightly surprising that there are fundamental domains for certain lattices which possess more symmetry than the point group of the corresponding lattice. For instance, the point group of the square lattice is D_4 (the dihedral group of order 8). But there is a fundamental domain of the square lattice with eightfold symmetry, its symmetry group being D_8. This fundamental domain, discovered by Veit Elser about 10 years ago, is of fractal appearance. In this talk we show that almost all planar lattices have fundamental domains with more symmetry than the point group of the underlying lattice. In the generic case this fundamental domain will be of fractal appearance. An application of this result to minimal matchings will be presented, together with some fancy pictures. If time allows, we will briefly outline the situation in higher dimensions.

Freitag, 15.11.2008 — Zeit: 17:45

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46 — Sektion I — G02-111 — 17:45

A Fast Maximum Cut Algorithm For Planar Graphs

FRAUKE LIERS (Köln)

The maximum cut problem is one of the classical combinatorial optimization problems. It asks for partitioning the node set V of a graph $G = (V, E)$ into two sets (one of which might be empty), such that the sum of weights of edges joining nodes in different partitions is maximum.
Cut problems have many applications, e.g., in the layout of electronic circuits, in the physics of disordered systems, or in network reliability.
Whereas maxcut is an NP-hard problem in general, it allows polynomial-time solution for planar graphs. In this talk, we present a new combinatorial algorithm for maximum cut on weighted planar graphs. Its worst-case running time can be bounded by $O(|V|^{1.5} \log |V|)$, similar to the fastest known method introduced by Shih, Wu and Kuo. As the latter, the problem is transformed to determining a minimum weighted perfect matching in some auxiliary graph. However, in our case the auxiliary graphs are considerably smaller. More specifically, we can determine maximum cuts in realistic and random planar graphs with up to 10^6 nodes.

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47 — Sektion II — G02-109 — 17:45

Inverse zero-sum problems

WOLFGANG SCHMID (Graz)

Let $(G, +)$ be a finite abelian group. A sequence $g_1 \dots g_\ell$ over G is called a zero-sum sequence if its sum $g_1 + \dots + g_\ell$ is equal to $0 \in G$. Davenport's constant of G, denoted $D(G)$, is the smallest n such that each sequence of length at least n has a subsequence that is a zero-sum sequence. The inverse problem associated to Davenport's constant is the problem of determining the structure of sequences of length $D(G) - 1$ that do not have a zero-sum subsequence. In this talk we discuss results on this problem, and some related questions, focusing on groups of rank two.

48 — Sektion III — G03-214 — 17:45

Asymptotic results for the number of unsuccessful parkers in a one-way street

ALOIS PANHOLZER (Wien)

Konheim and Weiss introduced in the Sixtees the notion of parking functions during their studies of a linear probing hashing algorithm. Recently Cameron, Johannsen, Prellberg and Schweitzer obtained an exact formula for the number of "defective parking functions with defect k". Such defective parking functions can be considered also as sequences $x_1, \dots, x_n \in \{1, \dots, m\}^n$ of addresses, such that, in a one-way street with m parking spaces and n arriving cars, exactly k cars are unsuccessful, i.e., cannot be parked.
Here we focus on asymptotic results and treat the random variable $X_{m,n}$, which denotes the number of unsuccessful cars for a random sequence of addresses for n cars and m parking spaces. We present, depending on the growth of m and n, the limiting behaviour of $X_{m,n}$ by characterizing the limit laws appearing.

49 — Sektion IV — G03-315 — 17:45

Voronoi cells of discrete point sets

INA VOIGT (Dortmund)

It is known that all cells of the Voronoi diagram of a Delone set are polytopes. And in case of a finite point set all these cells are polyhedra. We now want to investigate if something similar holds for arbitrary discrete point sets. We show that all Voronoi cells of a discrete point set are polytopes if and only if every point of the point set is an inner point. Further we introduce the term of a locally finitely generated discrete point set as a point set for which every direction cone is finitely generated and show that exactly these sets have the property of possessing only polyhedral Voronoi cells.

Samstag, 15.11.2008 — Zeit: 11:15

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50 — Sektion I — G02-111 — 11:15

The degree-sequence of random planar maps

DANIEL JOHANNSEN (Saarbrücken)

Connected planar maps can be recursively decomposed into biconnected submaps. This decomposition is well studied and has various applications in the enumeration of connected and biconnected planar maps. In addition, it allows for random sampling of connected maps given a sampler for biconnected maps. One approach to do so is to apply the framework of Boltzmann samplers, a technique which has become increasingly popular since its introduction five years ago. We analyze this sampling procedure with focus on the degree-sequence of the resulting random maps. It turns out that the degree sequence of random connected as well as biconnected maps becomes sharply concentrated as the number of edges tends to infinity.

This is joint work with Konstantinos Panagiotou.

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51 — Sektion II — G02-109 — 11:15

Minimal representations of semi-algebraic sets: New constructive results

GENNADIY AVERKOV (Magdeburg)

A set S of the form $S = \{p_1 \geq 0, \ldots, p_m \geq 0\}$, where $p_1, \ldots, p_m$ are real multivariate polynomials, is said to be elementary closed semi-algebraic. New results on the minimal possible choice of m for certain special classes of sets S (with as well as without restrictions on the degrees of the polynomials $p_1, \ldots, p_m$) will be discussed.

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52 — Sektion III — G03-214 — 11:15

Equivariant closure operators and trisp closure maps

JULIANE LEHMANN (Bremen)

A *trisp closure map* on a trisp (triangulated space) T is a partition of the vertex set of T into the *blue* vertices B and the *red* vertices R, together with a map $\phi : B \to R$ with the following property: Let σ be a simplex of T containing at least one blue vertex; let b be the minimal blue vertex of σ. If $\phi(b)$ is not a vertex of σ, then σ can be uniquely expanded by $\phi(b)$; otherwise $\phi(b)$ can be (uniquely) removed from σ. These were recently introduced by Kozlov and serve to show collapsibility of T onto the red subtrisp of T in a compact way. We will present some results about the interplay between trisp closure maps and group actions on T, in particular considering the special case where T is the nerve of a poset P and the trisp closure map comes from a closure operator on P.

53 — Sektion IV — G03-315 — 11:15

On the unit distance embeddability of connected cubic symmetric graphs

Eberhard H.-A. Gerbracht (Gifhorn)

We say that a graph is unit distance embeddable (or a unit distance graph), if its vertices can be represented by points in the Euclidean plane in such a way that adjacent vertices are represented by points having distance one. Although unit distance graphs form an area of active research in the area of Discrete Geometry, the list of prominent (connected) examples is rather small, and up until now mostly contains either obvious candidates (as e.g. the grid graphs), or some extraordiary specimens (like e.g. the Harborth graph).
On the other hand, in 1934 R.M. Foster published the first list of connected cubic symmetric graphs, i.e. graphs, which are 3-regular and possess an automorphism group which acts transitively on the set of arcs. This list has by now been expanded to the so-called “Foster Census”, which lists all of these graphs with up to 768 vertices (and some more).
In this talk we will present unit distance embeddings for all (connected) cubic symmetric graphs, with the number of vertices ranging from 8 to 32, and for one with 56 vertices. The methods used range from “nice drawings” and basic geometry to dynamic geometry and computer algebra, with major instruments being the dynamic mathematics software GeoGebra, and Mathematica. For a large percentage of these embeddings we will be able to give precise coordinizations, sometimes in form of characteristic polynomials for the coordinates of the vertices. As a side result we will have thus disproved an old “suspicion” of Chvatal.

54 — Sektion V — G03-106 — 11:15

Isometry classes of generalized associahedra

Carsten Lange (Berlin)

Generalized associahedra are convex polytopes that were defined by S. Fomin and A. Zelevinsky in the context of cluster algebras. They occur in different disguises in many other mathematical areas. For every finite Coxeter group W, an associated generalized associahedron can be constructed from the permutahdron of W after choosing an orientation of the Coxeter graph of W. We show that the isometry classes of these polytopes are given by certain automorphisms of orientad Coxeter graphs.

This is joint work with Nantel Bergeron, Christophe Hohlweg, and Hugh Thomas.

Samstag, 15.11.2008 — Zeit: 11:45

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55 — Sektion I — G02-111 — 11:45

On colorings of hypergraphs without monochromatic Fano planes

YURY PERSON (Berlin)

For k-uniform hypergraphs F and H and an integer r let $c_{r,F}(H)$ denote the number of r-colorings of the hyperedges of H with no monochromatic copy of F, and let $c_{r,F}(n) = \max_{H\in\mathcal{H}_n} c_{r,F}(H)$, where the maximum runs over all k-uniform hypergraphs on n vertices. Moreover, let $ex(n,F)$ be the usual *extremal* or *Turán function*.
In joint work with Lefmann, Rödl and Schacht we showed that for the hypergraph of the Fano plane F and $r = 2,3$ there exists an integer n_r, such that for every hypergraph H on $n \geq n_r$ vertices we have

$$c_{r,F}(H) \leq r^{ex(n,F)}.$$

Moreover, the only hypergraph H on n vertices with $c_{r,F}(H) = r^{ex(n,F)}$ is the extremal hypergraph for F, i.e., H is isomorphic to B_n the balanced, complete, bipartite hypergraph on n vertices. This however is no longer true for $r \geq 4$: $c_{r,F}(n) \gg r^{ex(n,F)}$.

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56 — Sektion II — G02-109 — 11:45

Lattice width directions and Minkowski's 3^d-theorem

BENJAMIN NILL (Berlin)

We show that the number of lattice directions in which a d-dimensional convex body in $\mathbb{R}^d$ has minimum width is at most $3^d - 1$, with equality only for the regular cross-polytope. This is deduced from a sharpened version of Minkowski's 3^d-theorem, for which we provide two independent proofs. The first one relies on a geometric result of Groemer, while the second one uses only considerations on congruences.

This is joint work with Jan Draisma and Tyrrell B. McAllister.

57 — Sektion III — G03-214 — 11:45

Foldable triangulations and real roots of polynomial systems

MICHAEL JOSWIG (Darmstadt)

Soprunova and Sottile [Adv. Math. 204(1):116–151, 2006] established a lower bound for the number of real roots of special multivariate polynomial systems in terms of triangulations of the Newton polytopes. We prove a general theorem about polynomial systems whose Newton polytopes decompose as products. Establishing a second theorem about the situation where the Newton polytopes are unit cubes additionally requires a massive exertion of computer algebra methods.

This is joint work with Nikolaus Witte.

58 — Sektion IV — G03-315 — 11:45

Hypergraph regularity and quasi-randomness

MATHIAS SCHACHT (Berlin)

Thomason and Chung, Graham, and Wilson were the first to systematically study quasi-random graphs and hypergraphs, and proved that several properties of random graphs imply each other in a deterministic sense. Their concepts of quasi-randomness match the notion of ε-regularity from the earlier Szemerédi regularity lemma. In contrast, there exists no "natural" hypergraph regularity lemma matching the notions of quasi-random hypergraphs considered by those authors. We discuss several notions of quasi-randomness for 3-uniform hypergraphs which correspond to the regularity lemmas of Frankl and Rödl, Gowers and Haxell, Nagle and Rödl. We establish an equivalence among the three notions of regularity of these lemmas. Since the regularity lemma of Haxell et al. is algorithmic, we obtain algorithmic versions of the lemmas of Frankl-Rödl (a special case thereof) and Gowers as corollaries. As a further corollary, we obtain that the special case of the Frankl-Rödl lemma (which we can make algorithmic) admits a corresponding counting lemma.

This is joint work with B. Nagle, A. Poerschke, and V. Rödl.

59 — Sektion V — G03-106 — 11:45

f-Vectors of 3-Manifolds

FRANK H. LUTZ (Berlin)

In 1970, Walkup completely described the set of f-vectors for the four 3-manifolds S^3, $S^2 \underline{\times} S^1$, $S^2 \times S^1$, and RP^3. We improve one of Walkup's main restricting inequalities on the set of f-vectors of 3-manifolds. Also, we derive a new lower bound on the number of vertices that are needed for a combinatorial d-manifold in terms of its β_1-coefficient, which partially settles a conjecture of Kühnel. Enumerative results and a search for small triangulations allow us, in combination with the new bounds, to completely determine the set of f-vectors for twenty further 3-manifolds, that is, for the connected sums of sphere bundles $(S^2 \times S^1)^{\#k}$ and twisted sphere bundles $(S^2 \underline{\times} S^1)^{\#k}$, where $k = 2, 3, 4, 5, 6, 7, 8, 10, 11, 14$.

This is joint work with Thom Sulanke and Ed Swartz.

Samstag, 15.11.2008 — Zeit: 13:40

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60 — Sektion I — G02-111 — 13:40

Experimental Results On Randomized Rumour Spreading

MARVIN KÜNNEMANN (Saarbrücken)

This talk will present results comparing the fully randomized and the quasirandom approach to the randomized rumour spreadingproblem (cf. Benjamin Doerr's abstract) experimentally. Tested on complete graphs, hypercubes and certain random graphs, the quasirandom approach generally is not only faster, but also its runtime happens to be more concentrated around its mean value. This effect also occurs in a non-synchronized model where each informed node sends at continuous times according to an exponential distribution.
Furthermore, the robustness against transmission errors is compared by using a model in which messages fail to be transmitted with a probability of 50.
Also, the influence of the choice of the rotor sequences is analyzed showing little difference between three alternatives used in the experiments.

This is joint work with Benjamin Doerr, Tobias Friedrich and Thomas Sauerwald.

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61 — Sektion II — G02-109 — 13:40

A dual of the binary rectangular segmentation problem

THOMAS KALINOWSKI (Rostock)

The rectangular segmentation problem asks for a decomposition of a given nonnegative integer matrix into a positive integer linear combination of binary matrices whose $1-$entries form a rectangle. The objective is to mimimize the sum of the coefficients. In general, there is a positive integrality gap, i.e. the linear relaxation does not have an integral optimal solution. For the special case of a binary input matrix, we show that the integrality gap vanishes. The proof is based on a nice dual formulation: Let A be a set of *grid squares* in the plane, i.e. the elements of A are squares $[i, i+1] \times [j, j+1]$ for natural numbers i and j. We want to fill the squares in A with the numbers 0, 1 and -1 such that the total sum is maximized, under the constraint that the sum over every rectangle, which is contained in A, is at most 1.

62 — Sektion III — G03-214 — 13:40

An order-based approach to solve some combinatorial linear programs

BRITTA PEIS (Berlin)

We present greedy- and approximation algorithms for some classes of combinatorial packing- and covering problems where the underlying structure forms a certain lattice. Our model covers optimization problems such as finding shortest paths, minimal arborescences, optimal bases of a polymatroid, or maximum flows in s, t-planar graph.

This is joint work with Ulrich Faigle.

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63 — Sektion IV — G03-315 — 13:40

Single-Source Min-Cost Flow Problem

FERNANDA SALAZAR (Berlin)

In the single source unsplittable min-cost flow problem we are given a digraph $D = (V, A)$, with arc capacities, arc costs, a single source node $s \in V$, and a set of K commodities having sink nodes $t_1, ..., t_K \in V$ and demands $d_1, ..., d_K$. All commodities must be routed simultaneously from the source to their corresponding sinks and the demand of each commodity must be routed along a single path. There is an open conjecture by Goemans which states that any given splittable flow satisfying certain demands can be turned into an unsplittable flow which satisfies the same demands, whose cost is not larger than the cost of the given splittable flow, and such that the flow value on any arc exceeds the original flow value on that arc by no more than the maximum demand. We prove a slightly weaker version of Goemans' conjecture.

This is joint work with Maren Martens and Martin Skutella.

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64 — Sektion V — G03-106 — 13:40

Hamiltonian submanifolds of the sporadic convex regular 4-polytopes

FELIX EFFENBERGER (Stuttgart)

We investigate polyhedral $2k$-manifolds as subcomplexes of the boundary complex of a regular polytope. We call such a subcomplex *k-Hamiltonian* if it contains the full k-skeleton of the polytope. This concept generalizes the notion of a Hamiltonian circuit in a graph. Since the case of the cube is well known and since the case of a simplex was also previously studied we focus on the case of the sporadic regular 4-polytopes and the cross polytope. By our results the existence of 1-Hamiltonian surfaces is now decided for all regular polytopes. In particular we have shown that no 1-Hamiltonian 2-manifolds exist in the boundary complexes of the 24-cell, the 120-cell and the 600-cell. Yet, the 24-cell admints 6 combinatorial types of pinch point surfaces with Euler Characteristic $\chi = -8$, examples of which will be given. The talk will focus on the case of the sporadic regular 4-polytopes and the combinatorial ideas involved in the proofs of the theorems.

The talk is based on joint work with Wolfgang Kühnel (Universität Stuttgart).

Samstag, 15.11.2008 — Zeit: 14:10

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65 — Sektion I — G02-111 — 14:10

Tight Bounds for Quasirandom Rumor Spreading

ANNA HUBER (Saarbrücken)

Randomized rumor spreading is a protocol for disseminating information in a network. The problem is as follows. Initially, one vertex of a finite, undirected connected graph has some piece of information (“rumor”). Each round, each vertex knowing the rumor tells it to a neighbor chosen uniformly at random. Results of Frieze and Grimmett show that in a complete graph on n vertices, this simple protocol succeeds in spreading the rumor from one node to all others within $(1 + o(1))(\log_2(n) + \ln(n))$ rounds with high probability. Benjamin Doerr, Tobias Friedrich and Thomas Sauerwald proposed a quasirandom analogue of the randomized rumor spreading model. Here, each vertex has a cyclic permutation of its neighbors. When first passing the rumor, it chooses a neighbor uniformly at random. All subsequent gossiping is done to the successors of this vertex in the cyclic permutation. For complete graphs, hypercubes and a broader range of random graphs it was then shown that this protocol also needs $O(\log n)$ rounds only to inform all other nodes. We show that for complete graphs we do not even lose a constant factor, that is, the protocol informs all nodes in $(1 + o(1))(\log_2(n) + \ln(n))$ rounds.

This is joint work with Benjamin Doerr (Max-Planck-Institut für Informatik, Saarbrücken).

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66 — Sektion II — G02-109 — 14:10

On the Maximum Number of Switching Parameters for the Penality Method

MARTIN DÖRNFELDER (Jena)

The penalty method generates alternatives for minimization problems of sum type as follow

- Generate an optimal solution.
- Multiply the weights of all elements which are part of the optimal solution with the factor $(1+\varepsilon)$ for a penalty parameter $\varepsilon > 0$.
- Generate an optimal solution for the problem with the modified weights.

This solution is called ε-alternative. The penalty parameters where the generated alternatives change are called switching parameters. For shortest path problems on DAGs with n vertices there are examples with $\frac{1}{4}n^2$ switching parameters. With an inclusion-exclusion-algorithm it can be shown that no DAG with n vertices and more than $\frac{1}{2}n^2$ switching parameters exists.

67 — Sektion III — G03-214 — 14:10

Circular-clique polytopes and circular-perfect graphs

ARNAUD PÊCHER (Bordeaux)

A major result of graph theory is that the chromatic number of a perfect graph is computable in polynomial time (Grötschel, Lovász and Schrijver 1981). The circular chromatic number is a well-studied refinement of the chromatic number of a graph. Xuding Zhu introduced circular-perfect graphs, a natural superclass of perfect graphs w.r.t. the circular chromatic number. It is unknown whether the circular-chromatic number of a circular-perfect graph is computable in polynomial time. In 2005, Coulonges, Pêcher and Wagler, introduced the intermediate class of strongly circular-perfect graphs, as those circular-perfect graphs whose complements are also circular-perfect. They also introduced a-perfect graphs, another superclass of perfect graphs. In this talk, we introduce the circular-clique polytope, and use it to prove that the weighted circular-clique number, and thus the circular chromatic number, of a strongly circular-perfect graph which is also a-perfect is computable in polynomial time.

68 — Sektion IV — G03-315 — 14:10

Regular matchstick graphs

SASCHA KURZ (Bayreuth)

A graph $G = (V, E)$ is called a unit-distance graph in the plane if there is an injective embedding of V in the plane such that every pair of adjacent vertices are at unit distance apart. If additionally the corresponding edges are non-crossing and all vertices have the same degree r we talk of a regular matchstick graph. Due to Euler's polyhedron formula we have $r \leq 5$. The smallest known 4-regular matchstick graph is the so called Harborth graph consisting of 52 vertices. In this talk we prove that no finite 5-regular matchstick graph exists.

69 — Sektion V — G03-106 — 14:10

How to Eat $\frac{4}{9}$ of a Pizza

TORSTEN UECKERDT (Berlin)

Given two players allowed to alternately pick pieces of a pizza sliced by radial cuts, such that after the first piece is taken every subsequent chosen piece is adjacent to a previously-taken one, we provide a strategy for the starting player to obtain $\frac{4}{9}$ of the pizza. This is best possible and settles a conjecture of Peter Winkler.

This is joint work with Kolja Knauer and Piotr Micek.

Samstag, 15.11.2008 — Zeit: 14:40

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70 — Sektion I — G02-111 — 14:40

Evolutionary Algorithms and the Travelling Salesperson Problem

MADELEINE THEILE (Berlin)

In this talk we will introduce a $(\mu + 1)$-EA which proves to be an exact TSP problem solver for a population of exponential size. We will show non-trivial upper bounds on the expected runtime until an optimum solution has been found. As far as we know this is the first time it has been shown that an NP-hard problem is solved exactly instead of approximated by an evolutionary algorithm. We will also discuss experimental results regarding the question whether it is possible to gain a speed-up by using crossover as opposed to using mutations only.

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71 — Sektion II — G02-109 — 14:40

Splitting maximal antichains in the homomorphism order

JAN FONIOK (Zürich)

The *homomorphism order* is the poset whose elements are digraphs and the order is defined by the existence of a homomorphism from one digraph to another. An *antichain* in a poset is a set of elements that are pairwise incomparable (that is, in our case, a set of graphs such that no homomorphisms exist among them). An antichain is *maximal* if each element of the poset is comparable to some element of the antichain. This means every element *not* in the maximal antichain is either above or below some element of the antichain. A maximal antichain A *splits* if it can be partitioned into two sets $A = F \cup D$ in such a way that every element not in A is either above an element of F or below an element of D. Some time ago we proved (and reported at KolKom'06) that all but two finite maximal antichains in the homomorphism order split. The proof was a little messy though, so we tried to identify which properties of the homomorphism order are needed. Thus we generalised the result in the context of Heyting algebras with sparse incomparability. I will discuss how the result applies to the order of digraphs and relational structures. This work has many overreaches, such as the one to constraint satisfaction. We show that finite maximal antichains correspond to finite dualities, which have a very close connection to some polynomially solvable cases of CSP.

This is joint work with Jaroslav Nešetřil and Claude Tardif.

72 — Sektion III — G03-214 — 14:40

Circular-imperfection of triangle-free planar graphs

CHRISTIAN WAGNER (Magdeburg)

Circular-perfect graphs form a natural superclass of the well-known perfect graphs by means of a more general coloring concept. For perfect graphs, a characterization by means of forbidden subgraphs was recently settled. It is, therefore, natural to ask for an analogous characterization of circular-perfect graphs or, equivalently, for a characterization of all minimally circular-imperfect graphs.
Our focus is the circular-(im)perfection of triangle-free planar graphs. We exhibit several new infinite families of minimally circular-imperfect triangle-free planar graphs. This shows that a characterization of circular-perfect graphs by means of forbidden subgraphs is a difficult task, even if restricted to the class of triangle-free planar graphs. This is in contrary to the perfect case where it is long-time known that the only minimally imperfect planar resp. triangle-free graphs are the odd holes.

73 — Sektion IV — G03-315 — 14:40

The Incompressibility Method and Lovász' Local Lemma

PASCAL SCHWEITZER (Saarbrücken)

The incompressibility method and the probabilistic method both portray ideas that can be applied to obtain bounds for combinatorial problems. Within the probabilistic method Lovász' Local Lemma has been used numerous times to show strong lower bounds, in many cases, especially for Ramsey type problems, yielding today's currently best known bounds.
In this talk I will first explain a classical concept of Ramsey Theory: the van der Waerden numbers. Taking them as an example I will recall how lower bounds for these integers can be obtained using the incompressibility method as well as the probabilistic method. I will show how the application of the incompressibility method to Ramsey problems can be strengthened to yield bounds in the same magnitude as those obtained via the Local Lemma.

74 — Sektion IV — G03-106 — 14:40

On the minimum size of 4-uniform hypergraphs without property B

PATRIC R. J. ÖSTERGÅRD (Helsinki)

A hypergraph is said to have property B if it is 2-colorable. Let $m(k)$ denote the minimum number of edges in a k-uniform hypergraph that does not have property B. Erdős and Hajnal introduced the problem of determining $m(k)$ in the early 1960s. The smallest cases, $m(2) = 3$ and $m(3) = 7$, are rather straightforward, but the next case has so far withstood all attacks; the possible values have been narrowed down to $21 \leq m(4) \leq 23$. By an exhaustive computer search, it is shown that $m(4) = 23$.

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