Liebe Teilnehmerinnen und Teilnehmer:

Zum 21. “Kolloquium über Kombinatorik” heißen wir Sie herzlich willkommen hier in den Räumen der Technischen Universität Carolo-Wilhelmina in Braunschweig, der Geburtsstadt von C. F. Gauß und R. Dedekind. Es ist für uns in diesem Jahr ein kleines Jubiläum, denn diese von Walter Deuber im Jahre 1981 in Bielefeld gestartete Konferenzserie findet nun zum zehnten Mal in Braunschweig statt.

Für die aktive Hilfe bei der Organisation danken wir einigen Studenten und ehemaligen Mitarbeitern.

Dem Präsidenten der Technischen Universität Braunschweig, Herrn Professor Dr. Jochen Litterst, danken wir für seine finanzielle Unterstützung.

Viele schöne Vorträge, interessante Gespräche und einen angenehmen Aufenthalt in Braunschweig, das wünschen Ihnen

Heiko Harborth
Arnfried Kemnitz
Hartmut Weiß

Diskrete Mathematik
Technische Universität Braunschweig

Freitag, 16.11.2001

9.30 **Eröffnung** (Hörsaal: PK 4.3)

9.45 **László A. Székely (Columbia, SC, USA)** (Hörsaal: PK 4.3)
"Crossing numbers and biplanar crossing numbers"

10.40 **Kaffeepause**

10.55 **Horst Sachs (Ilmenau)** (Hörsaal: PK 4.3)
"Counting perfect matchings in tessellations from a graph theoretic point of view"

11.50–13.30 **Mittagspause**

11.55–12.10 Special meeting of the **I**nstitute of **C**ombinatorics and its **A**pplications (Hörsaal: PK 4.3)

Zeit	Sektion I Raum PK14.3	Sektion II Raum PK14.4	Sektion III Raum PK14.6	Sektion IV Raum PK14.7
13.30	**M. Kriesell** **1** Average degree and contractibility	**B. Toft** **2** Hadwiger's conjecture revisited	**M. Kochol** **3** An equivalent version of the 3-flow conjecture	**B. Brešar** **4** Cubes polynomial and its derivatives: the case of median graphs
14.00	**S. Brandt** **5** Subgraphs in vertex neighbourhoods of K_r-free graphs	**M. Marangio** **6** Färbungen von Distanzgraphen	**A. Bezdek** **7** Shortest path problems on tilings	**H.-D. Gronau** **8** On super-simple $2-(v,5,2)$ designs
14.30	**D. Kühn** **9** Induced subdivisions in graphs of large average degree	**A. Hackmann** **10** The circular chromatic index	**U. Brehm** **11** Cyclic polyhedral maps	**H. Gropp** **12** Configurations and orbital matrices
15.00	**D. Osthus** **13** Topological cliques in graphs of large girth	**I. Schiermeyer** **14** Rainbow 5- and 6-cycles: A proof of the conjecture of Erdős, Simonovits and Sós	**S. Porschen** **15** On covering integer grid points by rectangular boxes	**S. Giese** **16** A way of characterizing divisible designs
15.30	**W. Mader** **17** High connectivity keeping sets in n-connected graphs	**B. Weißbach** **18** Zur chromatischen Zahl des $\mathbb{R}^d$	**A. Horbach** **19** On the symmetric k-cycle polytope	**S. Fekete** **20** Matching as the intersection of matroids
16.00	**Kaffeepause**			
16.30	**O. Pikhurko** **21** Size Ramsey numbers and linear programming	**A. Kohl** **22** Exact solutions of the frequency assignment problem for two special cellular phone networks	**H. Martini** **23** Reduced bodies in Minkowski space	**D. Rautenbach** **24** Some combinatorial reconstruction problems
17.00	**S. Krause** **25** Chessboard Ramsey numbers	**B. Randerath** **26** On satisfiable CNF-formulas closed under literal flipping	**P. Brass** **27** On point sets without k collinear points	**U. Baumann** **28** Automorphisms of coset graphs
17.30	**29**	**B. Voigt** **30** Management und Mathematik	**31**	**J. Heitzig** **32** Visualization of distances

19.00 **Gemeinsames Abendessen** im Ristorante „da Paolo", Lindenhof

Sonnabend, 17.11.2001

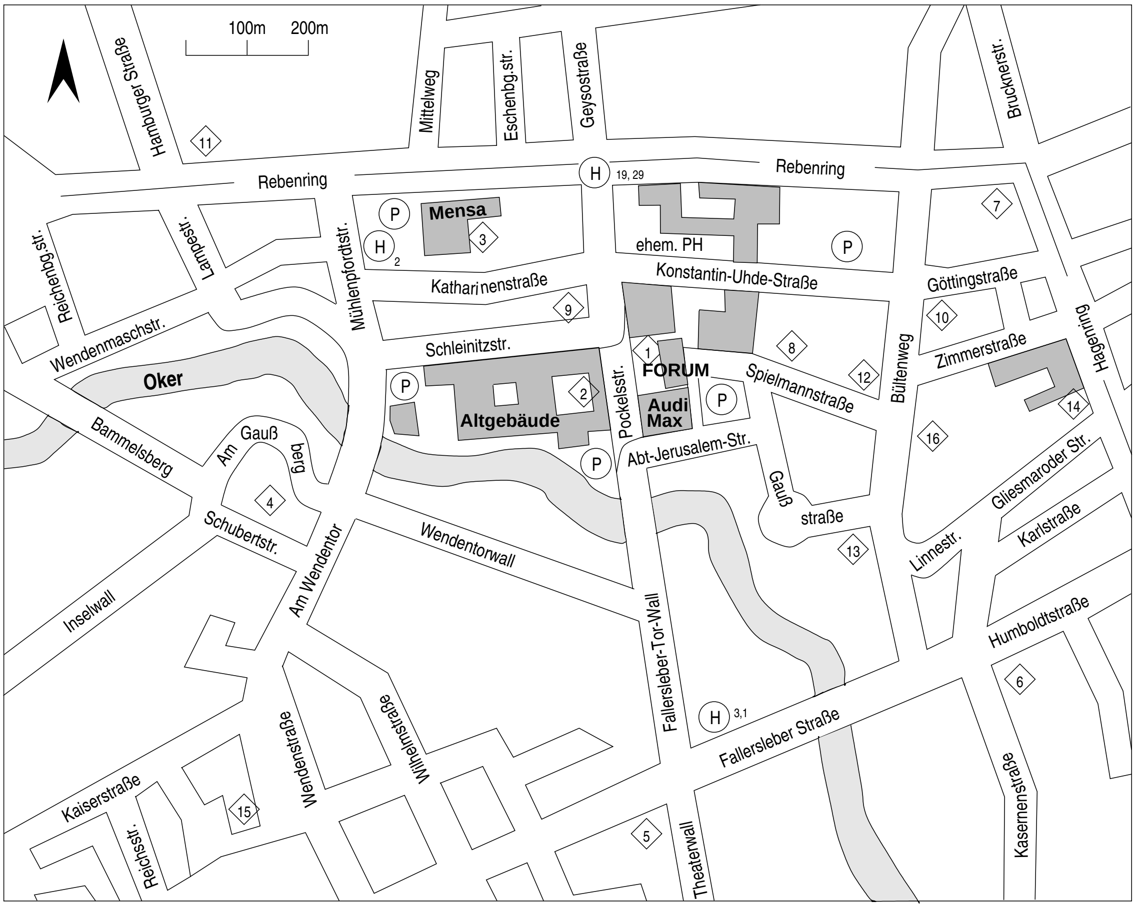
9.45	**Vladimir Boltyanski (Guanajuato, Mexico)** "New results on fixing systems for convex bodies"	(Hörsaal: PK 4.3)
10.40	**Kaffeepause**	
10.55	**Christina Mynhardt (Pretoria, South Africa)** "Exact domination numbers for toroidal queens graphs"	(Hörsaal: PK 4.3)
11.50–13.30	**Mittagspause**	

Zeit	Sektion I Raum PK14.3	Sektion II Raum PK14.4	Sektion III Raum PK14.6	Sektion IV Raum PK14.7
13.30	**C. Elsholtz 33** On a lattice point problem of Harborth and Kemnitz	**R. Diestel 34** Relating subsets of a poset: a decomposition theorem for WQOs	**M. Sonntag 35** Difference labelling of oriented cycles and trees	**T. Boehme 36** Long induced paths and forbidden complete bipartite minors
14.00	**W. Oberschelp 37** The binary order for continued roots and trigonometric functions	**K. Dohmen 38** Abstract tubes and network reliability analysis	**M. Erné 39** A paradox: The probability that an unlabeled finite poset is ordinally indecomposable	**H.-J. Voss 40** Light subgraphs of graphs embedded in compact 2-manifolds of minimum degree 5
14.30	**J. Quistorff 41** Some remarks on Plotkin's bound	**S. Felsner 42** Straight-line drawings on restricted integer grids	**H. Kajimoto 43** Connected labeled graphs which have many blocks and their counting by the Prüfer codes	**F. Berger 44** Sparse cycle bases in graphs
15.00	**45**	**X.-D. Zhang 46** Bipartite density of cubic graphs	**A. Eric 47** The circuitry of micro processor printers	**48**
15.30	**Kaffeepause**			

Raumplan

Hauptvorträge	:	Hörsaal PK 4.3 (Altgebäude, Pockelsstraße 4)
Sektionsvorträge	:	Hörsäle PK 14.3 und PK 14.4 (Forum, 3. Stockwerk) Hörsäle PK 14.6 und PK 14.7 (Forum, 5. Stockwerk)
Tagungsbüro	:	F 314 (Forum, Pockelsstraße 14, 3. Stockwerk)
Bibliothek	:	F 416 (Forum, 4. Stockwerk)
Cafeteria	:	F 314/315 (Forum, 3. Stockwerk)
Arbeitsraum	:	F 507 (Forum, 5. Stockwerk)
Fernsprecher	:	Erdgeschoß des Forumsgebäudes; Altgebäude, in der Nähe des Hörsaales PK 4.3; Pockelsstraße, gegenüber der Universitätsbibliothek Universitätsbibliothek

Öffnungszeiten von Tagungsbüro, Bibliothek, Cafeteria und Arbeitsraum:
Freitag, 9.00–18.30; Sonnabend, 9.00–16.30.



1 Forum, Pockelsstraße 14
2 Altgebäude, Pockelsstraße 4
3 Mensa, Katherinenstraße 1
4 Gaußdenkmal
5 Mephisto, Fallersleberstraße 35, 15.00–3.00
6 Ristorante “da Paolo” (Lindenhof), Kasernenstraße 20, 11.30–15.00, 18.00–23.00

7 Dialog (Bistro), Rebenring 48, 11.30–24.00
8 Eusebia (Bistro), Spielmannstraße 11, 9.00–2.00
9 Herman’s (Bistro), Schleinitzstraße 18, Fr. 9.30–2.00, Sa. 18.00–2.00
10 Konfuzius (Chinesisch), Bültenweg 81, 11.30–15.00, 18.00–23.30
11 Ana (Türkisch), Hamburger Straße 287, 10.00–1.00
12 R. P. McMurphy (Irisch Pub), Bültenweg 10, 16.00–2.00
13 Pico’s Bierladen (Türkisch), Bültenweg 6, 12.00–24.00
14 Choong Palast (Chinesisch), Gliesmaroderstraße 15, 11.30–15.00, 18.00–23.00
15 Teratai House (Indon.–Chin.), Wendenstraße 49/50, 12.00–15.00, 18.00–23.00
16 Viertel Nach (Bistro), Bültenweg 89, 9.00–2.00

Hauptvorträge

Vladimir Boltyanski (Guanajuato, Mexico)	: New results on fixing systems for convex bodies
Christina Mynhardt (Pretoria, South Africa)	: Exact domination numbers for toroidal queens graphs
Horst Sachs (Ilmenau)	: Counting perfect matchings in tessellations from a graph theoretic point of view
László A. Székely (Columbia, SC, USA)	: Crossing numbers and biplanar crossing numbers

Kurzvorträge

Ulrike Baumann (Dresden)	: Automorphisms of coset graphs
Franziska Berger (München)	: Sparse cycle bases in graphs
Andras Bezdek (Auburn, AL, USA)	: Shortest path problems on tilings
Thomas Boehme (Denton, TX, USA)	: Long induced paths and forbidden complete bipartite minors
Stephan Brandt (Ilmenau)	: Subgraphs in vertex neighbourhoods of K_r-free graphs
Peter Brass (Berlin)	: On point sets without k collinear points
Ulrich Brehm (Dresden)	: Cyclic polyhedral maps
Boštjan Brešar (Maribor, Slovenia)	: Cubes polynomial and its derivatives: the case of median graphs
Reinhard Diestel (Hamburg)	: Relating subsets of a poset: a decomposition theorem for WQOs
Klaus Dohmen (München)	: Abstract tubes and network reliability analysis
Christian Elsholtz (Clausthal-Zellerfeld)	: On a lattice point problem of Harborth and Kemnitz
Adu Gyamfi Poku Eric (Ghana)	: The circuitry of micro processor printers
Marcel Erné (Hannover)	: A paradox: The probability that an unlabeled finite poset is ordinally indecomposable
Sándor P. Fekete (Braunschweig)	: Matching as the intersection of matroids
Stefan Felsner (Berlin)	: Straight-line drawings on restricted integer grids
Sabine Giese (Berlin)	: A way of characterizing divisible designs
Hans-Dietrich Gronau (Rostock)	: On super-simple $2-(v,5,2)$ designs
Harald Gropp (Heidelberg)	: Configurations and orbital matrices
Andrea Hackmann (Braunschweig)	: The circular chromatic index
Jobst Heitzig (Hannover)	: Visualization of distances
Andrei Horbach (Magdeburg)	: On the symmetric k-cycle polytope
Hiroshi Kajimoto (Nagasaki, Japan)	: Connected labeled graphs which have many blocks and their counting by the Prüfer codes
Martin Kochol (Bratislava, Slovakia)	: An equivalent version of the 3-flow conjecture
Anja Kohl (Freiberg)	: Exact solutions of the frequency assignment problem for two special cellular phone networks
Stefan Krause (Braunschweig)	: Chessboard Ramsey numbers
Matthias Kriesell (Hannover)	: Average degree and contractibility

Daniela Kühn (Hamburg)	: Induced subdivisions in graphs of large average degree
Wolfgang Mader (Hannover)	: High connectivity keeping sets in n-connected graphs
Massimiliano Marangio (Braunschweig)	: Färbungen von Distanzgraphen
Horst Martini (Chemnitz)	: Reduced bodies in Minkowski space
Walter Oberschelp (Aachen)	: The binary order for continued roots and trigonometric functions
Deryk Osthus (Berlin)	: Topological cliques in graphs of large girth
Oleg Pikhurko (Cambridge, England)	: Size Ramsey numbers and linear programming
Stefan Porschen (Köln)	: On covering integer grid points by rectangular boxes
Jörn Quistorff (Hamburg)	: Some remarks on Plotkin's bound
Bert Randerath (Köln)	: On satisfiable CNF-formulas closed under literal flipping
Dieter Rautenbach (Aachen)	: Some combinatorial reconstruction problems
Ingo Schiermeyer (Freiberg)	: Rainbow 5- and 6-cycles: A proof of the conjecture of Erdős, Simonovits and Sós
Martin Sonntag (Freiberg)	: Difference labelling of oriented cycles and trees
Bjarne Toft (Odense, Denmark)	: Hadwiger's conjecture revisited
Bernd Voigt (Fernwald)	: Management und Mathematik
Heinz-Jürgen Voss (Dresden)	: Light subgraphs of graphs embedded in compact 2-manifolds of minimum degree 5
Bernulf Weißbach (Magdeburg)	: Zur chromatischen Zahl des $\mathbb{R}^d$
Xiao-Dong Zhang (Santiago, Chile)	: Bipartite density of cubic graphs

Weitere Teilnehmer

Francis Agyekum (Ghana), Adetayo Adio Akolawole (Nigeria), Percy Owusu Amankwa (Ghana), Kwame Apraku (Ghana), Richard Asoma (Ghana), Jens-P. Bode (Braunschweig), Detlef Dornieden (Braunschweig), Daniel Dua (Ghana), Ferenc Fodor (Szeged, Hungary), Emmanuel Tawiah Frimpong (Ghana), Yaw Frimpong (Ghana), Abdulai Fuseini (Ghana), Dieter Gernert (München), Jochen Harant (Ilmenau), Heiko Harborth (Braunschweig), Egbert Harzheim (Düsseldorf), Olof Heden (Stockholm, Sweden), Franz Hering (Dortmund), Gerold Jäger (Kiel), Christoph Josten (Frankfurt), Franz Kalhoff (Dortmund), Arnfried Kemnitz (Braunschweig), Silke Kubertin (Clausthal-Zellerfeld), Shan Kuta (Accra, Ghana), Kyeremateng Emmanuel (Ghana), Meinhard Möller (Braunschweig), Benoumhani Moussa (Sanaá, Yemen), Alexander Pott (Magdeburg), Ernest Ruet d'Auteuil (Winnipeg, Canada), Ryuichi Sawae (Okayama, Japan), Ralph Stanton (Winnipeg, Canada), Michael Stiebitz (Ilmenau), Tamio Sugawara (Nagasaki, Japan), Christian Thürmann (Braunschweig), Peter Tittmann (Mittweida), Margit Voigt (Ilmenau), Hartmut Weiß (Braunschweig)

Freitag, 17.11.2001 — Zeit: 9.45 — Hörsaal: PK 4.3

Crossing numbers and biplanar crossing numbers

LÁSZLÓ A. SZÉKELY (Columbia, SC, USA)

A *biplanar drawing of a graph* G means partitioning the edge set of the graph into two graphs, G_1 and G_2, and drawing G_1 and G_2 in two disjoint planes. A graph is *biplanar*, if it admits a biplanar drawing without edge crossings, i.e. the graph has thickness at most 2 (Beineke 1997). Biplanar drawings have obvious significance for VLSI, since such a drawing has physical realization using two sides of a chip, when vertices are present on both sides of the chip (Owens 1970). Unlike planarity, testing graph biplanarity is NP-complete (Mansfield 1983).
In this talk we study the biplanar crossing number $cr_2(G)$ of graph G. Formally, $cr_2(G) = \min cr(G_1) + cr(G_2)$, where $G_1 \cup G_2 = G$. Unfortunately, most of the results are counterexamples, which show that the study of biplanar crossing numbers is even harder than the study of crossing numbers. One negative result to mention is refutation to Halton's conjecture (Halton 1991), which claims that every graph with maximum degree 6 or less is biplanar.
This is a joint work with Ondrej Sýkora and Imrich Vrťo.

Freitag, 17.11.2001 — Zeit: 10.55 — Hörsaal: PK 4.3

Counting perfect matchings in tessellations from a graph theoretic point of view

HORST SACHS (Ilmenau)

In how many ways can a (generalized) chessboard be covered with dominoes? How many Kekule structures (i.e., single bond - double bond patterns) does the skeleton of a polycyclic hydrocarbon molecule have? How can Pauling's bond orders of such a molecule be calculated? These problems - and more general ones - are investigated in the theory of counting perfect matchings in plane graphs which in many cases provides a surprisingly beautiful solution.

Sonnabend, 17.11.2001 — Zeit: 9.45 — Hörsaal: PK 4.3

New results on fixing systems for convex bodies

VLADIMIR BOLTYANSKI (Guanajuato, Mexico)

Let $M \subset R^n$ be a compact, convex body. A set $F \subset \mathrm{bd}M$ is a *fixing system* for M if there is no vector $v \neq 0$ with $(\lambda v + F) \cap \mathrm{int}M = \emptyset$ for all $\lambda > 0$. A fixing system is primitive if no proper subset of it is a fixing system for M. By $\varrho_{\min}(M)$ (respectively, $\varrho_{\max}(M)$) we denote the smallest (respectively, largest) cardinality of primitive fixing systems for M.
L. Fejes Tòth proved $\varrho_{\max}(M) \leq 6$ in R^2. S.Fudali proved that this upper estimate is attained only for convex hexagons with pairwise parallel opposite sides. B. Grünbaum proved $n + 1 \leq \varrho_{\min}(M) \leq 2n$ in R^n. Using the functional $\mathrm{md}M$ (introduced by the speaker in 1976), V. Boltyanski, H. Martini, and E. Morales Amaya established a more exact estimate:

$$n + \frac{n}{\mathrm{md}M} \leq \varrho_{\min}(M) \leq 2n + 1 - \mathrm{md}M.$$

This result (obtained with the help of *illumination* of convex bodies) imply that Grünbaum's upper estimate is attained only for n-dimensional parallelotopes.
B. Bollobàs proved in 1967 that for any integer $q \geq 4$ there is a body $M \subset R^3$ with $\varrho_{\max}(M) \geq q$. In 1996 this result was improved by V. Boltyanski and H. Martini. They proved that there is a body $M \subset R^3$ with $\varrho_{\max}(M) = \infty$ (similarly in R^n for any $n \geq 3$). An interesting theorem in this direction was established in 1998 by E. Morales Amaya. Some results for zonotopes, zonoids, and belt bodies were established by V. Boltyanski and H. Martini (1996-2001).
In 2000 V. Boltyanski and E. Morales Amaya proved that for any compact, convex body $M \subset R^n$ with $\mathrm{md}M \geq 3$ the equality $\varrho_{\max}(M) = \infty$ holds. For the bodies with $\mathrm{md}M = 2$ they established exact upper bounds for $\varrho_{\max}(M)$ depending on n. Detailed statements will be given in the talk.
Recently V. Boltyanski and H. Gonzalez gave a complete classification of compact, convex bodies in R^2 with respect to $\varrho_{\max}(M)$. In other words, they gave a complete listing of planar figures with $\varrho_{\max}(M) = 3, 4, 5,$ or 6. This result will be published in Russian Doklady (in a short form) and with complete proofs in Auburn (USA). The result is connected with antipodal points and other combinatorial properties of convex figures. The complete statement will be given in the talk.

Sonnabend, 17.11.2001 — Zeit: 10.55 — Hörsaal: PK 4.3

Exact domination numbers for toroidal queens graphs

CHRISTINA MYNHARDT (Pretoria, South Africa)

Denote the $n \times n$ toroidal queens graph by Q_n^t and its domination number by $\gamma(Q_n^t)$. The study of the queens domination problem for chessboards on the torus was initiated in [A. P. Burger, E. J. Cockayne and C. M. Mynhardt, Queens graphs for chessboards on the torus, *Australasian J. Combin.*, to appear], where it was shown that $\gamma(Q_{3k}^t)$ is equal to k if $k \equiv 1, 5, 7, 11 (\mathrm{mod}\ 12)$, to $k+1$ if $k \equiv 2, 10 (\mathrm{mod}\ 12)$ and at least $k+1$ if $k \equiv 0, 3, 4, 6, 8, 9 (\mathrm{mod}\ 12)$.
We show that $\gamma(Q_{3k}^t) = k+2$ if $k \equiv 0, 3, 4, 6, 8, 9 (\mathrm{mod}\ 12)$, thus completing the calculation of $\gamma(Q_n^t)$ for $n \equiv 0 (\mathrm{mod}\ 3)$.

Freitag, 16.11.2001 — Zeit: 13.30

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1 — Sektion I — Raum PK14.3 — 13.30

Average degree and contractibility

MATTHIAS KRIESELL (Hannover)

An edge in a k-connected graph is called *k-contractible* if its contraction yields again a k-connected graph. A classical result in graph theory states that for $k \leq 3$, every noncomplete k-connected graph contains a k-contractible edge (TUTTE 1961). For $k \geq 4$, a similar result is not true, but there are conditions to the girth (THOMASSEN 1981), to the minimum degree (EGAWA 1990), or to degree sums, which ensure the existence of a k-contractible edge in a noncomplete k-connected graph. The talk will be about density conditions which guarantee the existence of such an edge.

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2 — Sektion II — Raum PK14.4 — 13.30

Hadwiger's conjecture revisited

BJARNE TOFT (Odense, Denmark)

Hadwiger's Conjecture from 1943 suggested a far reaching generalization of the Four Colour Theorem, and it is perhaps the most interesting conjecture of graph theory. In 1995 I gave a lecture at the Kolloquium über Kombinatorik in Braunschweig on the history of the conjecture and the progress in research on it. The main purpose of the present talk will be to give a survey of two recent investigations on alpha = 2 graphs and on 7-chromatic graphs. These investigations have been carried out with M.D. Plummer and M. Stiebitz, and K. Kawarabayashi.

3 — Sektion III — Raum PK14.6 — 13.30

An equivalent version of the 3-flow conjecture

MARTIN KOCHOL (Bratislava, Slovakia)

A graph admits a nowhere-zero 3-flow if its edges can be oriented and assigned values $\pm 1, \pm 2$ so that the sum of the incoming values equals the sum of the outcoming ones for every vertex of the graph. The 3-flow conjecture of Tutte is that every bridgeless graph without a 3-edge cut has a nowhere-zero 3-flow. We show that it suffices to prove this conjecture for 5-edge-connected graphs.

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4 — Sektion IV — Raum PK14.7 — 13.30

Cubes polynomial and its derivatives: the case of median graphs

BOŠTJAN BREŠAR (Maribor, Slovenia)

Let $\alpha_i(G)$ be the number of induced i-cubes of a graph G. Then the cubes polynomial $c(G,x)$ of G is introduced as $\sum_{i\geq 0} \alpha_i(G)x^i$. It is shown that any function f with two related, natural properties, is up to the factor $f(K_1,x)$ the cubes polynomial. The derivation $\partial\, G$ of a median graph G is introduced and it is proved that the cubes polynomial is the only function f with the property $f'(G,x) = f(\partial\, G,x)$ provided that $f(G,0) = |V(G)|$. As the main application of the new concept, several relations that widely generalize previous such results for median graphs are proved. For instance, it is shown that for any $s \geq 0$ we have $c^{(s)}(G,x+1) = \sum_{i\geq s} \frac{c^{(i)}(G,x)}{(i-s)!}$, where certain derivatives of the cubes polynomial coincide with well-known invariants of median graphs.

Freitag, 16.11.2001 — Zeit: 14.00

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5 — Sektion I — Raum PK14.3 — 14.00

Subgraphs in vertex neighbourhoods of K_r-free graphs

STEPHAN BRANDT (Ilmenau)

In a K_r-free graph, the neighbourhood of every vertex induces a K_{r-1}-free subgraph. We characterize those K_r-free graphs, where a converse statement holds: Every induced K_{r-1}-free subgraph is contained in the neighbourhood of a vertex. The proof is based on the characterization in the case $r = 3$ for triangle-free graphs due to Pach (1981).

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6 — Sektion II — Raum PK14.4 — 14.00

Färbungen von Distanzgraphen

MASSIMILIANO MARANGIO (Braunschweig)

Ein Distanzgraph $G(S, D)$ mit $S \subseteq \mathbb{R}^n$ und $D \subseteq \mathbb{R}^+$ ist ein Graph mit Knotenmenge S und Kanten zwischen allen Knoten u und v, für die der euklidische Abstand $\|u - v\|_2 \in D$ ist.
Mit $\chi(G)$ wird die chromatische Zahl eines Graphen G bezeichnet, mit $\chi'(G)$ die kantenchromatische Zahl, mit $\chi''(G)$ die totalchromatische Zahl und mit $ch(G)$, $ch'(G)$, $ch''(G)$ die entsprechenden listenchromatischen Zahlen.
Im Vortrag werden für $n = 1$ für alle Färbungsparameter obere Schranken in Abhängigkeit von $|D|$ bestimmt sowie für $n \geq 2$ Schranken und exakte Werte angegeben.

7 — Sektion III — Raum PK14.6 — 14.00

Shortest path problems on tilings

ANDRAS BEZDEK (Auburn, AL, USA)

We study that version of the shortest path problem when an edge-to-edge tiling is given and one wants to navigate avoiding the interiors of the tiling. We are seeking strategies which optimize the worst case ratio of the distance covered to the straight distance between the start and the target point. We give estimates for different types of tilings and also show as a corollary that in case of lattice circle covering there exists a path which achieves the ratio $\sqrt{2}$ conjectured by G. Fejes Tóth.

8 — Sektion IV — Raum PK14.7 — 14.00

On super-simple $2-(v,5,2)$ designs

HANS-DIETRICH GRONAU (Rostock)

A $2-(v,k,\lambda)$ design D is a collection of k-element subsets, called blocks, of a v-element underlying set V such that any 2-element subset of V belongs to exactly λ blocks. D is called super-simple, if any two blocks share at most 2 elements. The existence of super-simple $2-(v,4,\lambda)$ designs with $\lambda = 2,3,4$ were settled completely.
We present the almost complete spectrum of super-simple $2-(v,5,2)$ designs. This is joint work with D. Kreher and A. Ling

Freitag, 16.11.2001 — Zeit: 14.30

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9 — Sektion I — Raum PK14.3 — 14.30

Induced subdivisions in graphs of large average degree

DANIELA KÜHN (Hamburg)

A classical theorem of Mader states that for every graph H there exists $d = d(H)$ such that every graph G of average degree at least d contains a subdivison of H. (A subdivision of a graph H is a graph obtained by replacing the edges of H with internally disjoint paths.) Obviously, the result becomes false if we ask for an *induced* subdivision of H. However, this stronger assertion does hold if G is 'locally sparse' in the sense that it does not contain a complete bipartite graph $K_{s,s}$:
For every graph H and every s there exists $d = d(H,s)$ such that every graph G of average degree at least d contains either a $K_{s,s}$ as a subgraph or an induced subdivision of H.
In this talk I will try to give a very rough sketch of the proof and mention some related conjectures. The result is joint work with Deryk Osthus.

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10 — Sektion II — Raum PK14.4 — 14.30

The circular chromatic index

ANDREA HACKMANN (Braunschweig)

A (k,d)-edge coloring ($k, d \in \mathbb{N}$, $k \geq 2d$) of a graph G is an assignment c of colors $\{0, 1, \dots, k-1\}$ to the edges of G such that $d \leq |c(e_1) - c(e_2)| \leq k - d$ whenever two edges e_1 and e_2 are adjacent. The circular chromatic index $\chi'_c(G)$ ist defined by $\chi'_c(G) = \inf\{k/d : G$ has a $(k,d) -$ edge coloring$\}$. We prove several properties of $\chi'_c(G)$ and determine exact values for some classes of graphs.

11 — Sektion III — Raum PK14.6 — 14.30

Cyclic polyhedral maps

ULRICH BREHM (Dresden)

A polyhedral map on a compact 2-manifold is called cyclic if a cyclic group of automorphisms acts sharply transitively on the set of vertices and on the set of faces. A cyclic polyhedral map is called of type $(\{n, n\}, m)$ if it has m vertices (thus m faces) and all vertices are n-valent (thus all faces are n-gons).
Results: Each cyclic polyhedral map is self-dual and can be canonically described by a double difference sequence“ (if it is not type $(\{4, 4\}, m)$).
For each $n \leq 12$ all numbers m are determined for which a cyclic polyhedral map of type $(\{n, n\}, m)$ exists, (separately for orientable and nonorientable maps).
For each $n < 144$ the minimal number m is determined for which a cyclic polyhedral map of type $(\{n, n\}, m)$ with an edge transitive automorphism group exists.
(Joint work with Matthias Jamet).

12 — Sektion IV — Raum PK14.7 — 14.30

Configurations and orbital matrices

HARALD GROPP (Heidelberg)

An *orbital matrix OM(v,k,x;λ)* is a matrix A of size v with non-negative integer entries and row and column sum k such that $AA^t = (k + x - \lambda)I_v + \lambda J_v$ where I_v and J_v denote the identity matrix and the all-one-matrix of size v and A^t denotes the transpose of A.
An orbital matrix with entries 0 and 1 is the incidence matrix of a symmetric design. For more than two different entries, however, a lot of new problems arise which should be discussed in the future. Only very few of these problems have been solved until now.
Some of these orbital matrices are related to symmetric configurations which were already defined 125 years ago.
A *symmetric configuration* v_k is a finite incidence structure of v elements and v blocks such that each block contains k elements, each element occurs on k blocks, and 2 different elements occur in a common block at most once.

Freitag, 16.11.2001 — Zeit: 15.00

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13 — Sektion I — Raum PK14.3 — 15.00

Topological cliques in graphs of large girth

DERYK OSTHUS (Berlin)

In my talk, I will discuss the following result on topological minors in locally sparse graphs, obtained together with Daniela Kühn:
Every graph of minimum degree at least r and girth at least 186 contains a subdivision of K_{r+1} and for large r a girth of at least 15 suffices.
This improves a result of Mader, who gave a bound on the girth required which is linear in r. It also implies that the conjecture of Hajós that every graph of chromatic number at least r contains a subdivision of K_r (which is false in general) is true for graphs of girth at least 186 (or 15 if r is large). We also obtain results of a similar nature for ordinary minors.

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14 — Sektion II — Raum PK14.4 — 15.00

Rainbow 5- and 6-cycles: A proof of the conjecture of Erdős, Simonovits and Sós

INGO SCHIERMEYER (Freiberg)

For $n \geq k \geq 3$, let $f(n, C_k)$ denote the maximum number m for which it is possible to colour the edges of the complete graph K_n with m colours in such a way that each k-cycle C_k in K_n has at least two edges of the same colour. Equivalently, any edge-colouring of K_n with at least $f(n, C_k) + 1$ colours contains a rainbow k-cycle C_k. Erdős, Simonovits and Sós conjectured that for every fixed $k \geq 3$, $f(n, C_k) = n(\frac{k-2}{2} + \frac{1}{k-1}) + O(1)$, and proved it for $k = 3$ by showing that $f(n, C_3) = n - 1$. Alon has shown that $f(n, C_4) = \lfloor \frac{4n}{3} \rfloor - 1$, and the conjecture thus proved for $k = 4$.
In this talk we will present $f(n, C_5)$ and $f(n, C_6)$ and thus prove the conjecture for $k = 5$ and $k = 6$. We will also present $f(n, K_k)$ for all $n \geq k \geq 4$ and $f(n, kK_2)$ for all $k \geq 2$ and $n \geq 3k + 3$.

15 — Sektion III — Raum PK14.6 — 15.00

On covering integer grid points by rectangular boxes

STEFAN PORSCHEN (Köln)

A problem of combinatorial geometry is discussed: Cover a finite set of points lying on an integer grid in the Euclidean plane by regular rectangles such that the total area, circumference and number of rectangles used is minimized. This problem should be NP-hard, which is surely the case for related problems concerning covering points arbitrarily distributed in the plane. For any reasonable value k being the minimal allowed side length for rectangles, we propose an exact deterministic algorithm based on set theoretic dynamic programming, which then is improved by exploiting the rectangular and underlying grid structure. We also discuss a variant given by a further parameter p bounding the maximal possible covering cardinality. For this, we are able to find a time bound by a polynomial of degree $O(p)$. Finally, a generalization to arbitrary (finite) space dimensions is given.

16 — Sektion IV — Raum PK14.7 — 15.00

A way of characterizing divisible designs

SABINE GIESE (Berlin)

A lot of different designs are already known. In this lecture we will talk about divisible designs and a way of characterizing them. A given divisible design with a dual translation group can be described up to isomorphism by a divisible design whose points are affine subspaces of the same dimension, pointclasses are parallelclasses and blocks are transversal subsets of these affine subspaces.

Freitag, 16.11.2001 — Zeit: 15.30

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17 — Sektion I — Raum PK14.3 — 15.30

High connectivity keeping sets in n-connected graphs

WOLFGANG MADER (Hannover)

We prove that for all positive integers n and k there is an integer $g(n,k)$ so that every n-connected, finite graph G of order exceeding $g(n,k)$ contains a set S of k vertices such that $G-S$ is $(n-2)$-connected. We also study what happens if we add for the deleted set S the condition that $G(S)$ is connected.

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18 — Sektion II — Raum PK14.4 — 15.30

Zur chromatischen Zahl des $\mathbb{R}^d$

BERNULF WEISSBACH (Magdeburg)

P. Frankl und R. M. Wilson zeigten 1981, dass für genügend hohe Dimension d die Ungleichung

$$\chi(\mathbb{R}^d) > 1,207\ldots^d$$

besteht. In jüngster Zeit gelang es A. M. Raigorodskii und dem Autor unabhängig voneinander diese Abschätzung etwas zu verbessern. Es gilt

$$\chi(\mathbb{R}^d) > 1,239\ldots^d,$$

falls d groß genug ist. Im Vortrag werden die zu diesem Ergebnis führenden Wege vorgestellt.

19 — Sektion III — Raum PK14.6 — 15.30

On the symmetric k-cycle polytope

ANDREI HORBACH (Magdeburg)

We consider the convex hull of incidence vectors of k-nodes cycles on the complete n-nodes graph. This convex hull is known as the Symmetric k-Cycle Polytope denoted SP_n^k. This polytope is a kind of generalization of the Travelling Salesman Polytope. The Symmetric k-Cycle Polytope will be discussed in the connection with other cycle polytopes. The partial facet description will be presented. Adjacency of the extreme points will be discussed. Some results on estimate of diameter will be presented.

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20 — Sektion IV — Raum PK14.7 — 15.30

Matching as the intersection of matroids

SÁNDOR P. FEKETE (Braunschweig)

This paper deals with the problem of representing the matching independence system in a graph as the intersection of finitely many matroids. After characterizing the graphs for which the matching independence system is the intersection of two matroids, we study the function $\mu(n)$, which is the minimum number of matroids that need to be intersected in order to obtain the set of matchings on a graph with n vertices. We describe an integer programming formulation for deciding whether $\mu(n) \leq m$. Using combinatorial arguments, we prove that $\mu(n) \in \Omega(\log\log n)$. On the other hand, we establish that $\mu(n) \in O(\log n/\log\log n)$. Finally, we prove that $\mu(n) = 4$ for $n = 5, \dots, 12$, and $\mu(n) = 5$ for $n = 13, \dots, 20$. (Joint work with Robert T. Firla and Bianca Spille)

Freitag, 16.11.2001 — Zeit: 16.30

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21 — Sektion I — Raum PK14.3 — 16.30

Size Ramsey numbers and linear programming

OLEG PIKHURKO (Cambridge, England)

A graph G *arrows* a pair (F_1, F_2) if every blue-red colouring of $E(G)$ contains a blue F_1 or a red F_2; the *size Ramsey number* $\hat{r}(F_1, F_2)$ is the smallest number of edges that G can have.
Recently, the author (`arXiv:math.CO/0101197`) has asymptotically computed (via linear programming) size Ramsey numbers involving certain complete bipartite graphs, in particular answering the question of Erdős, Faudree, Rousseau and Schelp (1978) about the asymptotics of $\hat{r}(K_{s,n}, K_{s,n})$ for fixed s and large n.
Here we concentrate on an attempt to extend this method to a larger class of problems by considering the 'simplest' open case when one of the forbidden graphs is $S_{n,1}$ (which is $K_{1,n}$ with one edge subdivided). Although new non-trivial results are obtained such as, for example, $\hat{r}(K_{2,n}, S_{n,1}) \approx 9n$ and $\hat{r}(K_{3,n}, S_{n,1}) \approx 16n$, even this 'simple' case remains open.

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22 — Sektion II — Raum PK14.4 — 16.30

Exact solutions of the frequency assignment problem for two special cellular phone networks

ANJA KOHL (Freiberg)

The Frequency Assignment Problem (FAP) as it is encountered when operating a Cellular Phone Network can be described as follows: Frequencies have to be assigned to base stations (BS) in the way that every BS gets the required number of frequencies while obeying special constraints. These constraints arise because of the fact that interference between frequencies can occur under certain conditions. The aim of the FAP is to minimize the span of frequencies needed.
It is well known that the FAP is a generalized graph colouring problem and therefore it is NP-hard. We present a graph-theoretical model of the FAP using the so-called interference graph. Then we solve the FAP for two phone networks with fixed constraints. The first one is a network where the underlying interference graph is a clique, the second one consists of two cliques connected by one edge.
The applied solution techniques are not very useful for phone networks of more general structure.

23 — Sektion III — Raum PK14.6 — 16.30

Reduced bodies in Minkowski space

HORST MARTINI (Chemnitz)

The concept of reduced bodies was introduced by E. Heil (1978): A convex body which does not properly contain a convex body of the same minimal width is said to be reduced. Some results about reduced bodies in Euclidean n-space are known, but still there are various open problems, e.g.: Are there reduced polytopes for $n > 2$, or is each strictly convex reduced body (also for $n > 2$) necessarily of constant width? In this talk the notion of reducedness is extended to Minkowski n-spaces. Some basic geometric properties of reduced bodies (also depending on properties of the unit balls) are presented. (Joint work with Marek Lassak)

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24 — Sektion IV — Raum PK14.7 — 16.30

Some combinatorial reconstruction problems

DIETER RAUTENBACH (Aachen)

One of the most well-known open conjectures about finite graphs is the *reconstruction conjecture*. The work on this conjecture has led several people to consider reconstruction problems for various other objects apart from graphs.
Here we study such problems for finite sets of points in the Euclidean space $\mathbf{R}^n$ that are given up to the action of certain groups of isometries.
Our results generalize and unify previous work by Harary, Manvel and Maynard. We use an algebraic approach originally due to Lovász and further developped by Alon, Caro, Krasikov andÁroditty.

Freitag, 16.11.2001 — Zeit: 17.00

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25 — Sektion I — Raum PK14.3 — 17.00

Chessboard Ramsey numbers

STEFAN KRAUSE (Braunschweig)

The $n \times n$-chessboard B_n is interpreted as the graph B_n with the vertex points of the squares as vertices, and with the sides as edges. We will ask for the minimum number $r = r(G, H)$ such that every two-coloring (green and red) of the edges of B_r contains a given subgraph G in green or a given subgraph H in red. That is, we ask for a Ramsey like number where instead of the complete graphs K_n the chessboard graphs B_n serve as 'host graphs'.

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26 — Sektion II — Raum PK14.4 — 17.00

On satisfiable CNF-formulas closed under literal flipping

BERT RANDERATH (Köln)

In this talk we consider a problem due to J. Kleine Büning: What are the monotone CNF-formulas remaining satisfiable under literal flipping. For 2CNF-formulas of this kind we can associate the following graph. The vertex set corresponds to the set of variables and the edge set corresponds to the set of clauses, i. e. for each clause the corresponding variables are joint by an edge. Now, applying graph-theoretic methods we determine all 2CNF-formulas of this kind. Moreover, we give some evidence indicating that the corresponding decisision problem, whether a monotone 3CNF-formula remains satisfiable under literal flipping, is intractable.

27 — Sektion III — Raum PK14.6 — 17.00

On point sets without k collinear points

PETER BRASS (Berlin)

In this talk I will present improved bounds for two problems by Erdős on point sets that are 'almost in general position', i.e. containing no k collinear points. One is the generalized orchard problem, the maximum number of $(k-1)$-point lines in a set of n points without k collinear points. The other is the question for the existence of large subsets with no $(k-1)$ points collinear in a set of n points with no k points collinear. In both cases the improvements turn out to be quite simple. A number of further promising open problems on point-line incidences will be discussed.

28 — Sektion IV — Raum PK14.7 — 17.00

Automorphisms of coset graphs

ULRIKE BAUMANN (Dresden)

We consider automorphism groups of finite digraphs whose edge set can be decomposed into oriented cycles. The cycles are coloured in such a way that any two cycles of equal colour are vertex-disjoint. These coloured digraphs can be represented as coset digraphs of groups defined by the colouring. This property can be used to characterize subgroups of the automorphism group of the underlying digraph. A $\mathcal{P}$-automorphism is defined to be a digraph automorphism which preserves the decomposition $\mathcal{P}$ into coloured cycles. Groups of $\mathcal{P}$-automorphisms are investigated. The isomorphism class of these groups is determined for each decomposition $\mathcal{P}$.

Freitag, 16.11.2001 — Zeit: 17.30

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29 — Sektion I — Raum PK14.3 — 17.30

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30 — Sektion II — Raum PK14.4 — 17.30

Management und Mathematik

BERND VOIGT (Fernwald)

Überraschenderweise findet man Mathematiker in Managementpositionen weitaus häufiger als zum Beispiel Informatiker. Es wird erläutert, warum dies so ist, und worin für Unternehmen der Mehrwert liegt, verstärkt Mathematiker einzusetzen. Es wird die These vertreten, dass Mathematiker im besonderen Maße geeignet sind, mit dem sich wandelnden Umfeld vorurteilsfrei umzugehen.

31 — Sektion III — Raum PK14.6 — 17.30

32 — Sektion IV — Raum PK14.7 — 17.30

Visualization of distances

JOBST HEITZIG (Hannover)

Different types of two- and three-dimensional representations of a finite metric space are studied that focus on the accurate representation of the linear order among the distances rather than their actual values.
I present lower and upper bounds for representability probabilities that have been produced by experiments including random generation, rubber-band optimization, and automatic proof generation.
Moreover, it will be shown that in contrast to nearest neighbour representations, in the plane there is always both a farthest neighbour representation, and a representation that leads to the same cluster tree as the original space.

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33 — Sektion I — Raum PK14.3 — 13.30

On a lattice point problem of Harborth and Kemnitz

CHRISTIAN ELSHOLTZ (Clausthal-Zellerfeld)

Let $f(n,d)$ denote the least integer such that any choice of $f(n,d)$ elements in $\mathbb{Z}_n^d$ contains a subset of size n whose sum is zero. HARBORTH proved that $(n-1)2^d+1 \leq f(n,d) \leq (n-1)n^d+1$. It is known that $f(n,1)=2n-1$ and KEMNITZ conjectured that $f(n,2)=4n-3$. While the upper bound was greatly improved by ALON and DUBINER to $c_d\, n$ very little is known about the lower bounds. Only for $n=3^a$ it was known that $f(n,d) > (n-1)2^d+1$, so that it seemed possible that for a fixed dimension, but a sufficiently large prime p, the lower bound might determine the true value of $f(p,d)$. In this note we show that this is not the case. In fact, for all odd $n \geq 3$ and $d \geq 3$ we show that $f(n,d) \geq \left(\frac{9}{8}\right)^{\lfloor \frac{d}{3} \rfloor}(n-1)2^d+1$ holds.

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34 — Sektion II — Raum PK14.4 — 13.30

Relating subsets of a poset: a decomposition theorem for WQOs

REINHARD DIESTEL (Hamburg)

Given an infinite partial order $(P,\leq)$ and subsets $A,B \subseteq P$, write $A \leq B$ if for every $a \in A$ there is a $b \in B$ with $a \leq b$. This is a transitive and reflexive relation on the power set of P, which induces a partial ordering on its $\sim$-equivalence classes, where $A \sim B$ if $A \leq B$ and $B \leq A$.
Call a set $A \subseteq P$ *small* if $P \not\leq A$, and *essential* if its complement is small, i.e. if every $B \subseteq P$ equivalent to P meets A. A poset is *divisible* if it is a union of two small subsets.
Among the subsets of P (with the induced ordering), indivisible sets behave like primes:
Lemma: Let $A, B_1, B_2 \subseteq P$. If A is indivisible and $A \leq B_1 \cup B_2$, then $A \leq B_1$ or $A \leq B_2$.
And indeed, if P is a WQO (say) we have the following pretty prime factor theorem:
Theorem: If P has no infinite antichain, then P partitions into finitely many indivisible essential subsets $A_1,\ldots,A_n$. This partition is unique up to equivalence; in fact, every indivisible essential subset of P is equivalent to one of the A_i.
Problem: Find some natural real-(maths-)world posets with a non-trivial factorization!
Details: `http://www.math.uni-hamburg.de/home/diestel/papers/Subsets.dvi`

35 — Sektion III — Raum PK14.6 — 13.30

Difference labelling of oriented cycles and trees

MARTIN SONNTAG (Freiberg)

It is known that many undirected graphs (e.g. trees, cycles, certain cacti, complete graphs, ...) are difference graphs.
The case of directed graphs is more complicated, only a few results are known, e.g. for oriented paths, digraphs with a total sink and alternating trees. For oriented cycles and a class of oriented trees, we describe algorithms which can be used to construct difference labellings.
An important problem is to find construction principles to produce difference digraphs from given ones.

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36 — Sektion IV — Raum PK14.7 — 13.30

Long induced paths and forbidden complete bipartite minors

THOMAS BOEHME (Denton, TX, USA)

The main result of the talk is the following result which has been proved by Bojan Mohar, Riste Skrekowski (University of Ljubljana), Michael Stiebitz (TU Ilmenau) and the author.

Theorem: *For every $k, r, s \in N$ there is an $n \in N$ such that every k-connected graph of order at least n contains either an induced path of length s or a subdivision of the complete bipartite graph $K_{k,r}$.*

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37 — Sektion I — Raum PK14.3 — 14.00

The binary order for continued roots and trigonometric functions

WALTER OBERSCHELP (Aachen)

The explicit form $0 = \frac{1}{2}\sqrt{0}, \frac{1}{2} = \frac{1}{2}\sqrt{1}, \frac{1}{2}\sqrt{2}, \frac{1}{2}\sqrt{3}, 1 = \frac{1}{2}\sqrt{4}$ for the very common values of the cosine-Function and certain observations for multiples of 9° make us suspect, that there is some hidden system behind that. We represent numbers in $I = [0;2]$, i.e. values of $2\cos x$ in $0 \le x \le \frac{1}{2}\pi$ as infinite 'continued roots'

$$\sqrt{2 + (-)\sqrt{2 + (-)\sqrt{2 + (-)\sqrt{2 + \dots}}}}$$

The resulting $+/-$ notation for real numbers in I shows many similarities to the representation of I by infinite dual fractions. In our case the usual order in I is reflected by an 'inclusion/exclusion'-code, which is essentially the well known Gray code and which can easily be converted from the usual binary enumeration code. For convenience we use the degree measure for angles. We explain why the 'pilot values' $\sqrt{2} = 2\cos 45° = 1.41421356\dots$, $\Phi = \frac{1}{2}(\sqrt{5}+1) = 2\cos 36° = 1.61803398\dots$ and $\sqrt{3} = 2\cos 30° = 1.73205080\dots$ suffice for a 'root representation' for multiples of 9°. Adding, e.g., $\Psi = 2\cos 12° = 1.95629520\dots$ (which is a radical) allows a radical representation for all multiples of 3°. It is well known that no other integer degrees are representable as radicals. We show, that all rational multiples of 90° have a finite or ultimately periodic representation of their cos-values as continued roots and that these are algebraic numbers. This representation is essentially unique and can be calculated easily with the help of interesting structure rules for continued roots.

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38 — Sektion II — Raum PK14.4 — 14.00

Abstract tubes and network reliability analysis

KLAUS DOHMEN (München)

An *abstract tube* is a pair $(\mathcal{A}, \mathcal{S})$, consisting of a finite collection of sets $\mathcal{A} = (A_v)_{v\in V}$ and an abstract simplicial complex $\mathcal{S} \subseteq \mathcal{P}^*(V)$ such that the subcomplex $\mathcal{S}(\omega) := \{I \in \mathcal{S} \,|\, \omega \in \bigcap_{i\in I} A_i\}$ is contractible for almost every $\omega \in \bigcup_{v\in V} A_v$ with respect to some dominating measure.
Using the machinery of algebraic topology, Naiman and Wynn (1997) proved that any abstract tube gives rise to an improved inclusion-exclusion identity and associated truncation bounds where the summation range is restricted to $\mathcal{S}$. In general, these new bounds are at least as sharp as their classical Bonferroni counterparts although less computational effort is required for their evaluation. Additionally, the improved identity may lead to polynomial-time algorithms for problems where the dimension of the associated simplicial complex is bounded by a constant.
In this talk, we review the relevant concepts and results, and provide several examples from graph theory, geometry and reliability. The main focus will be on network reliability analysis.

39 — Sektion III — Raum PK14.6 — 14.00

A paradox: The probability that an unlabeled finite poset is ordinally indecomposable

MARCEL ERNÉ (Hannover)

A partially ordered set (poset) is *ordinally indecomposable* if it cannot be written as an ordinal sum of two nonempty posets. Similarly, a lattice is *vertically indecomposable* if it is not the vertical sum of two lattices with more than one element. Since there is a decomposition preserving one-to-one correspondence between unlabeled finite posets and distributive lattices, it might be tempting to say that the probability for a finite poset to be ordinally indecomposable is the same as the probability for a finite distributive lattice to be vertically indecomposable. It is not difficult to show that the quotients $o(n)/p(n)$, where $p(n)$ is the number of unlabeled posets with n points and $o(n)$ is that of all ordinally indecomposable posets among them, tends to 1, while, on the other hand, denoting by $d(n)$ the number of unlabeled distributive lattices with n points and $v(n)$ the number of vertically indecomposable ones, we have much evidence (but no complete proof) that the quotients $v(n)/d(n)$ tend to 0.

40 — Sektion IV — Raum PK14.7 — 14.00

Light subgraphs of graphs embedded in compact 2-manifolds of minimum degree 5

HEINZ-JÜRGEN VOSS (Dresden)

A graph H is said to be *light* in a class $\mathcal{C}$ of graphs if at least one member of $\mathcal{C}$ contains a copy of H and there is an integer $\phi(H,\mathcal{C})$ such that each member G of $\mathcal{C}$ with a copy of H also has a copy of H with maximum degree $\Delta_G(H) \leq \phi(H,\mathcal{C})$ in G. The *weight* $w(H)$ of a subgraph H of a graph G is the sum of the valencies (in G) of its vertices. Recently, with S. Jendrol' we studied light subgraphs in the class $\mathcal{C}_\mathcal{M}$, where $\mathcal{C}_\mathcal{M}$ is *the class of all graphs G of minimum degree $\geq$ 5 and order $\geq$ 2000 $|\chi(\mathcal{M})|$ embedded in a fixed compact 2-dimensional manifold $\mathcal{M}$ of Euler characteristic $\chi(\mathcal{M}) \leq$ 0*. Some of our results are:

(i) The graph $G \in \mathcal{C}_\mathcal{M}$ has a 3-cycle C_3 of weight $w(C_3) \leq$ 18.

(ii) The graph $G \in \mathcal{C}_\mathcal{M}$ has a 4-cycle $\overline{C}_4$ with one diagonal of weight $w(\overline{C}_4) \leq$ 27. Moreover, if G has no 12-vertices, or no 12-, and 11-vertices, or no 12-, 11-, and 10-vertices then G has a 4-cycle $\overline{C}_4$ with a diagonal of weight $w(\overline{C}_4) \leq$ 26, or $w(\overline{C}_4) \leq$ 25, or $w(\overline{C}_4) \leq$ 24, respectively.

(iii) The graph $G \in \mathcal{C}_\mathcal{M}$ has a 5-cycle $\overline{C}_5$ with a diagonal of weight $w(\overline{C}_5) \leq$ 32. Moreover, if G has no 12-vertices then G has a 5-cycle $\overline{C}_5$ with a diagonal of weight $w(\overline{C}_5) \leq$ 31.

All bounds are tight.

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41 — Sektion I — Raum PK14.3 — 14.30

Some remarks on Plotkin's bound

JÖRN QUISTORFF (Hamburg)

In coding theory, Plotkin's upper bound on the maximal cadinality of a code with minimum distance at least d is well known. He presented it for binary codes where Hamming and Lee metric coincide. After a brief discussion of the generalization to q-ary codes preserved with the Hamming metric, the talk considers the application of Plotkin's bound to q-ary codes preserved with the Lee metric. A result of Wyner/Graham is improved. (Talk in German with English slides.)

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42 — Sektion II — Raum PK14.4 — 14.30

Straight-line drawings on restricted integer grids

STEFAN FELSNER (Berlin)

Given an a subset S of the integer grid in 2 or 3 dimensions, which graphs admit straight-line crossing-free drawings with vertices located at the grid points of S? We characterize the trees that can be drawn on $X_k = \{(x, y) : x, y \in \mathbb{Z}$ and $0 \leq y < k\}$. A necessary condition for G to be drawable on X_k is that G is planar and $\mathsf{pathwidth}(G) \leq k$. Motivated by the results on the plane we investigate restrictions of the integer grid in 3 dimensions and show that every outerplanar graph can be drawn on the prism $P = \{(x, y, z) : x \in \mathbb{Z}, y, z \in \{0, 1\}$ and $x + y \leq 1\}$. (Joint work with Stephen Wismath and Guiseppe Liotta)

43 — Sektion III — Raum PK14.6 — 14.30

Connected labeled graphs which have many blocks and their counting by the Prüfer codes

HIROSHI KAJIMOTO (Nagasaki, Japan)

We give an extended Prüfer code (or rather the Prüfer decomposition) for all connected labeled graphs G those have many blocks. The code of G consists of a pair (c, B) where c is a sequence of all cut points of G and B is a set of all blocks of G. The Prüfer code records the order and way of connecting the blocks each other to assemble a graph. We then get a bijective correspondence between connected labeled graphs and the Prüfer codes. By counting the codes we obtain a combinatorial proof of a formula of Ford-Uhlenbeck(1956) that enumerates connected labeled graphs whose blocks are of given type. Our result has the substantial significance when a graph has a large number of blocks, but in this talk we would like to explain how to decompose and how to count graphs by taking an example which has relatively few blocks. (Joint work with Tamio Sugawar)

44 — Sektion IV — Raum PK14.7 — 14.30

Sparse cycle bases in graphs

FRANZISKA BERGER (München)

A basis of the cycle space of an undirected graph G is used in Electric Network Analysis for checking the Kirchhoff voltage law. In order to enhance computational performance, this cycle basis should preferably be sparse. Exact algorithms to find a *minimum* cycle basis are too time- and storage-consuming to be useful in practice, since model graphs of electric networks can get large (up to order 10^6).

Known heuristic algorithms include forming a sparse fundamental cycle basis, for instance. This is a basis constructed from a spanning tree T of G by taking the unique cycles $T + e$, where e runs through all non-tree edges. New heuristic methods which improve the results of these algorithms are presented, and their application is discussed.

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45 — Sektion I — Raum PK14.3 — 15.00

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46 — Sektion II — Raum PK14.4 — 15.00

Bipartite density of cubic graphs

XIAO-DONG ZHANG (Santiago, Chile)

We first obtain the exact value for bipartite density of a cubic line graph on n vertices. Then we give an upper bound for the bipartite density of cubic graphs in terms of the smallest eigenvalue of the adjacency matrix. In addition we characterize, except in the case $n = 20$, those graphs for which the upper bound is obtained. (Joint work with Abraham Berman)

47 — Sektion III — Raum PK14.6 — 15.00

The circuitry of micro processor printers

Adu Gyamfi Poku Eric (Ghana)

1. Microprocessor circuitry and its function: A. ALU, B. CU (control unit), C. R (registrar)
2. The circuit diagram
3. Microcomputer motherboard buses, categories, and functions: A. processor bus, B. address bus, C. memory bus, D. input and output buses
4. The board buses diagrams of communication: A. processor bus diagram, B. memory bus diagram
5. The role of importance in microcomputers: A. how channels link itselfs in communication, B. The rate of transfering informations to other peripherials

48 — Sektion IV — Raum PK14.7 — 15.00

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