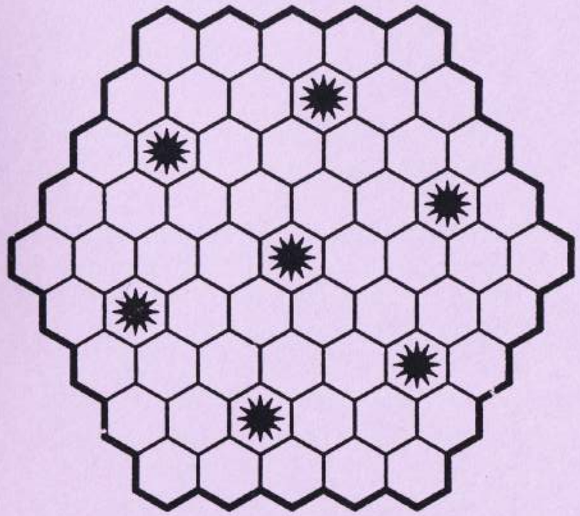
KOLLOQUIUM
ÜBER
KOMBINATORIK

17.-18. November 2000



Diskrete Mathematik

TECHNISCHE UNIVERSITÄT
BRAUNSCHWEIG

Liebe Teilnehmerinnen und Teilnehmer:

In diesem Jahr treffen wir uns zum 20. "Kolloquium über Kombinatorik", das jährlich im November stattfindet. Nach den ersten 10 Jahren in Bielefeld und zwischenzeitlich einem Jahr in Hamburg wird diese Tagung nun zum neunten Mal hier in Braunschweig durchgeführt. Wir begrüßen Sie dazu recht herzlich in der Technischen Universität Carolo-Wilhelmina.

Zur Durchführung der Tagung sind wir immer auf freiwillige Hilfe aus der Studentenschaft angewiesen. Wir möchten uns hier bei allen Helfern sehr herzlich bedanken.

Für eine finanzielle Unterstützung bedanken wir uns vielmals bei dem Präsidenten der Technischen Universität Braunschweig, Herrn Professor Dr. J. Litterst.

Allen Teilnehmern, sowohl den "Stammgästen" als auch denjenigen, die zum ersten Mal hier sind, wünschen wir viele schöne Vorträge, erfolgreiche Gespräche, interessante Anregungen und einige schöne Tage in Braunschweig.

Heiko Harborth
Arnfried Kemnitz
Christian Thürmann
Hartmut Weiß

Diskrete Mathematik
Technische Universität Braunschweig

Freitag, 17. 11. 2000

9.30 **Eröffnung** (Hörsaal: PK 4.3)

9.45 **Margit Voigt (Ilmenau)** (Hörsaal: PK 4.3)
"List colorings of graphs"

10.40 **Kaffeepause**

10.55 **Brian Alspach (Regina, Canada)** (Hörsaal: PK 4.3)
"Decomposing complete directed graphs into fixed length directed cycles"

11.50–13.30 **Mittagspause**

Zeit	Sektion I Raum PK 14.3	Sektion II Raum PK 14.4	Sektion III Raum PK 14.6	Sektion IV Raum PK 14.7	Sektion V Raum PK 14.8
13.30	**R. Laue** 1 On 10^{15} new simple 7-designs on 25 points	**A. Hoffmann** 2 Chromatic number and regular factors	**C. Elsholtz** 3 The distribution of sequences in residue classes	**H. Lefmann** 4 A deterministic polynomial time algorithm for Heilbronn's problem in dimension three	**H.-M. Teichert** 5 Sum numbers for two types of cycle hypergraphs
14.00	**P. Östergård** 6 Recent existence and nonexistence results in design theory	**M. Marangio** 7 Knoten- und Listenknotenfärbungen ganzzahliger Distanzgraphen	**P. Kirschenhofer** 8 On a class of combinatorial diophantine equations related to the Meixner-Pollaczek polynomials	**P. Braß** 9 On sets with many point-hyperplane incidences	**M. Sonntag** 10 Difference labellings of cacti
14.30	**T. Prellberg** 11 On the asymptotic analysis of a class of linear recurrences	**D. Bokal** 12 Chromatic index critical graphs of order 14	**W. Oberschelp** 13 General birth-death-dynamics in demographic cohorts	**F. Fodor** 14 On Malfatti's packing	**D. Kühn** 15 Subgraphs of high girth and large average degree
15.00	**A. Rosa** 16 Specialized colourings of Steiner systems and maximal arcs	**A. Hackmann** 17 Critically edge colourable planar graphs	**D. Osthus** 18 Constrained evolution of random graphs	**J. Quistorff** 19 Improved sphere bounds in finite metric spaces by decompositions of the underlying space	**M. Fischermann** 20 Unique minimum dominating sets of graphs
15.30	**O. Pikhurko** 21 Size Ramsey numbers of stars versus bipartite graphs	**S. Grünewald** 22 A partial solution of Vizing's planar graph conjecture	**S. Lievens** 23 On distance in the rotation graphs of labeled and unlabeled trees	**G. Blind** 24 Packing a convex domain with nonequal circles	**T. Schoen** 25 On a problem of Erdős and Sárközy
16.00	**Kaffeepause**				
16.30	**S. Krause** 26 Ramsey numbers for parallel colorings	**M. Kriesell** 27 Critical connectivity of graphs and domination in hypergraphs	**B. Randerath** 28 On two combinatorial problems in a propositional logic framework	**H. Gropp** 29 The millennium edge and 100 years Georges Brunel	**U. v. Nathusius** 30 In how far does the boundary of a patch determine its interior?
17.00	**S. Brandt** 31 Ramsey-Turán type problems	**W. Hochstättler** 32 The fractional flow number of an orientable matroid	**F. Hering** 33 An algorithm for constructing Hadamard matrices	**S. Felsner** 34 Infeasibility of systems of inequalities	**D. Rautenbach** 35 Approximately covering by cycles in a planar graph
17.30	**I. Schiermeyer** 36 New Ramsey numbers for cycles	**D. Van Dyck** 37 Which cubic graphs are Yutsis graphs?	**K. Dohmen** 38 Das Zuverlässigkeits-überdeckungsproblem	39	**V. B. Le** 40 Stable sets with given properties

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

KOLLOQUIUM ÜBER KOMBINATORIK – 17. UND 18. NOVEMBER 2000
DISKRETE MATHEMATIK – TU BRAUNSCHWEIG

Sonnabend, 18. 11. 2000

9.45 **Nathaniel Dean (Houston, U.S.A.)** (Hörsaal: PK 4.3)
"Drawing nonplanar graphs in the plane"

10.40 **Kaffeepause**

10.55 **Ralph Faudree (Memphis, U.S.A.)** (Hörsaal: PK 4.3)
"Degenerate extremal problems"

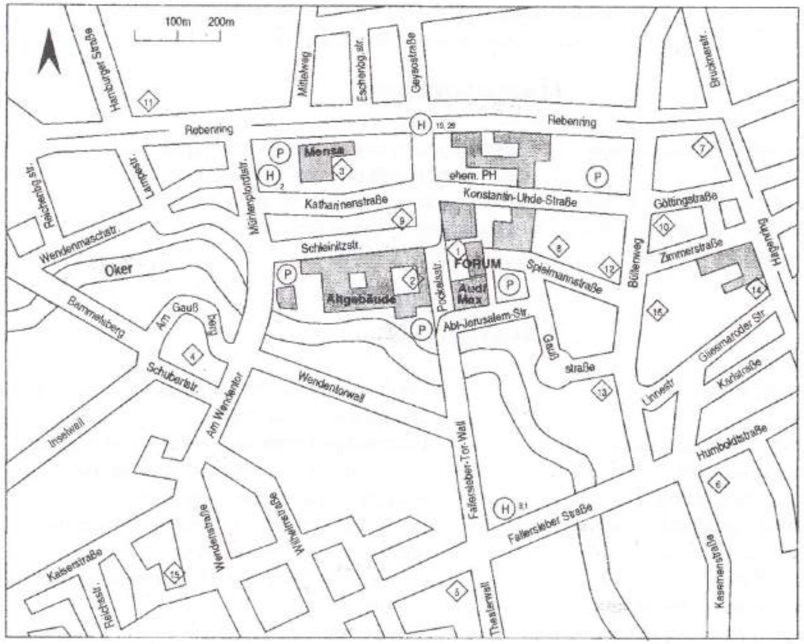
11.50–13.30 **Mittagspause**

Zeit	Sektion I Raum PK 14.3	Sektion II Raum PK 14.4	Sektion III Raum PK 14.6	Sektion IV Raum PK 14.7	Sektion V Raum PK 14.8
13.30	**T. Böhme** 41 Toughness and minors in graphs	**F. Göring** 42 New short proofs of Menger's Graph Theorem	**B. Ganter** 43 Pseudo models and propositional Horn inference	**P. Tittmann** 44 Ein chromatisches Unabhängigkeitspolynom	**I. Althöfer** 45 On the computation of alternatives in combinatorial optimization problems
14.00	**R. Čada** 46 Closure concepts and local properties of graphs	**M. Grüttmüller** 47 Orthogonal double covers of $K_{n,n}$	**S. Giese** 48 Construction and characterization of divisible designs	**M. Mann** 49 The chromatic number of some rational spaces	**E. Köhler** 50 AT-free, coAT-free graphs
14.30	**Z. Tuza** 51 Matchings and P_3-partitions motivated by process control	**M. Kochol** 52 Equivalence of Fleischner's and Thomassen's conjectures	**H. Aydinian** 53 Extremal problems under dimension constraint	**B. Laß** 54 On the chromatic polynomial	**J. Weyer-Menkhoff** 55 Reconstruction of phylogenetic trees from DNA-Data (and edge-colourings of K_5 and K_6)
15.00	**Kaffeepause**				
15.30	**M. Naatz** 56 Acyclic orientations of mixed graphs and the xyz-inequality	**A. Wumaier** 57 Degree bounds for the circumference of 3-connected graphs	**G. Brinkmann** 58 Hunting posets	**W. Wenzel** 59 Symmetrisierungs-prozesse für Hüllenoperatoren	**S. Lisken** 60 CaGe – a graph generating, embedding and visualizing environment

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, PK 14.7 und PK 14.8 (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 (Münz– und Kartenfernsprecher)

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

Brian Alspach (Regina, Canada)	Decomposing complete directed graphs into fixed length directed cycles
Nathaniel Dean (Houston, U.S.A.)	Drawing nonplanar graphs in the plane
Ralph Faudree (Memphis, U.S.A.)	Degenerate extremal problems
Margit Voigt (Ilmenau)	List colorings of graphs

Kurzvorträge

Ingo Althöfer (Jena)	On the computation of alternatives in combinatorial optimization problems
Harutyun Aydinian (Bielefeld)	Extremal problems under dimension constraint
Gerd Blind (Stuttgart)	Packing a convex domain with nonequal circles
Thomas Böhme (Ilmenau)	Toughness and minors in graphs
Drago Bokal (Ljubljana, Slovenija)	Chromatic index critical graphs of order 14
Stephan Brandt (Berlin)	Ramsey-Turán type problems
Peter Braß (Berlin)	On sets with many point-hyperplane incidences
Gunnar Brinkmann (Bielefeld)	Hunting posets
Roman Cada (Plzeň, Czech Republic)	Closure concepts and local properties of graphs
Klaus Dohmen (München)	Das Zuverlässigkeitsüberdeckungsproblem
Dries Van Dyck (Gent, Belgium)	Which cubic graphs are Yutsis graphs?
Christian Elsholtz (Clausthal-Zellerfeld)	The distribution of sequences in residue classes
Stefan Felsner (Berlin)	Infeasibility of systems of inequalities
Miranca Fischermann (Aachen)	Unique minimum dominating sets of graphs
Ferenc Fodor (Cookeville, U.S.A.)	On Malfatti's packing
Bernhard Ganter (Dresden)	Pseudo models and propositional Horn inference
Sabine Giese (Berlin)	Construction and characterization of divisible designs
Frank Göring (Ilmenau)	New short proofs of Menger's graph theorem
Harald Gropp (Heidelberg)	The millennium edge and 100 years Georges Brunel
Stefan Grünewald (Bielefeld)	A partial solution of Vizing's planar graph conjecture
Martin Grüttmüller (Rostock)	Orthogonal double covers of $K_{n,n}$
Andrea Hackmann (Braunschweig)	Critically edge colourable planar graphs
Franz Hering (Dortmund)	An algorithm for constructing Hadamard matrices
Winfried Hochstättler (Clausthal-Zellerfeld)	The fractional flow number of an orientable matroid
Arne Hoffmann (Aachen)	Chromatic number and regular factors
Peter Kirschenhofer (Leoben, Österreich)	On a class of combinatorial diophantine equations related to the Meixner-Pollaczek polynomials
Martin Kochol (Bratislava, Slovakia)	Equivalence of Fleischner's and Thomassen's conjectures
Ekkehard Köhler (Berlin)	AT-free, coAT-free graphs
Stefan Krause (Braunschweig)	Ramsey numbers for parallel colorings
Matthias Kriesell (Hannover)	Critical connectivity of graphs and domination in hypergraphs
Daniela Kühn (Hamburg)	Subgraphs of high girth and large average degree
Bodo Laß (Aachen)	On the chromatic polynomial
Reinhard Laue (Bayreuth)	On 10^{15} new simple 7-designs on 25 points
Van Bang Le (Rostock)	Stable sets with given properties
Hanno Lefmann (Chemnitz)	A deterministic polynomial time algorithm for Heilbronn's problem in dimension three
Stijn Lievens (Gent, Belgium)	On distance in the rotation graphs of labeled and unlabeled trees
Sebastian Lisken (Bielefeld)	CaGe – a graph generating, embedding and visualizing environment
Matthias Mann (Bielefeld)	The chromatic number of some rational spaces
Massimiliano Marangio (Braunschweig)	Knoten- und Listenknotenfärbungen ganzzahliger Distanzgraphen
Michael Naatz (Berlin)	Acyclic orientations of mixed graphs and the xyz-inequality
Ulrike von Nathusius (Bielefeld)	In how far does the boundary of a patch determine its interior?
Walter Oberschelp (Aachen)	General birth-death-dynamics in demographic cohorts
Patric Östergård (Helsinki, Finland)	Recent existence and nonexistence results in design theory
Deryk Osthus (Berlin)	Constrained evolution of random graphs
Oleg Pikhurko (Cambridge, UK)	Size Ramsey numbers of stars versus bipartite graphs
Thomas Prellberg (Clausthal-Zellerfeld)	On the asymptotic analysis of a class of linear recurrences
Jörn Quistorff (Hamburg)	Improved sphere bounds in finite metric spaces by decompositions of the underlying space
Bert Randerath (Köln)	On two combinatorial problems in a propositional logic framework
Dieter Rautenbach (Aachen)	Approximately covering by cycles in a planar graph
Alexander Rosa (Hamilton, Canada)	Specialized colourings of Steiner systems and maximal arcs
Ingo Schiermeyer (Freiberg)	New Ramsey numbers for cycles
Tomasz Schoen (Kiel)	On a problem of Erdős and Sárközy
Martin Sonntag (Freiberg)	Difference labellings of cacti
Hanns-Martin Teichert (Lübeck)	Sum numbers for two types of cycle hypergraphs
Peter Tittmann (Mittweida)	Ein chromatisches Unabhängigkeitspolynom
Zsolt Tuza (Budapest, Hungary)	Matchings and P_3-partitions motivated by process control
Walter Wenzel (Chemnitz)	Symmetrisierungsprozesse für Hüllenoperatoren
Jan Weyer-Menkhoff (Bielefeld)	Reconstruction of phylogenetic trees from DNA-data (and edge-colourings of K_5 and K_6)
Aierken Wumaier (Berlin)	Degree bounds for the circumference of 3-connected graphs

Weitere Teilnehmer

Ulrike Baumann (Dresden), Franziska Berger (München), Roswitha Blind (Stuttgart), Jens-P. Bode (Braunschweig), Rainer Bodendiek (Kiel), Ulrike Bostelmann (Clausthal-Zellerfeld), Detlef Dornieden (Braunschweig), Dieter Gernert (München), Eberhard Girlich (Magdeburg), Rudolf Halin (Mölln), Jochen Harant (Ilmenau), Heiko Harborth (Braunschweig), Egbert Harzheim (Düsseldorf), Michael Höding (Magdeburg), Andreas Huck (Hannover), Tommy Jensen (Hamburg), Christoph Josten (Frankfurt), Heinz Adolf Jung (Berlin), Tomas Kaiser (Plzeň, Czech Republic), Arnfried Kemnitz (Braunschweig), Gerhard Koester (Elmshorn), Gunter Laßmann (Berlin), Ingrid Mengersen (Braunschweig), Meinhard Möller (Braunschweig), Alexander Pott (Magdeburg), Jens Schreyer (Ilmenau), Christian Thürmann (Braunschweig), Hartmut Weiß (Braunschweig), Gerhard Wesp (Salzburg, Austria)

List colorings of graphs

MARGIT VOIGT, Ilmenau

Given a graph G and an assignment $\mathcal{L} = \{L(v) \mid v \in V(G)\}$ of lists of admissible colors for its vertices, we say that G is *$\mathcal{L}$-list colorable* if the vertices of G can be properly colored (i.e., adjacent vertices receive distinct colors) so that each vertex v is colored with a color from $L(v)$. If all list of $\mathcal{L}$ have the same size k, $\mathcal{L}$ is called a k-assignment. The minimum integer k such that G is $\mathcal{L}$-list colorable for every k-assignment $\mathcal{L}$, is called the *list chromatic number* of G (or the *choice number* of G) and is denoted by $\chi_\ell(G)$. The graph G is called *k-choosable* if $\chi_\ell(G) \leq k$. A more general concept of *list set colorings* stems from set colorings of graphs. In this case vertices of a given graph should be assigned sets of colors of prescribed size, say q, so that adjacent vertices are assigned disjoint sets. A graph G is called *$\mathcal{L}$-list q-set colorable* if G has a proper q-set coloring f with $f(u) \subseteq L(u)$ for every u. The graph G is *(p,q)-choosable* if it is $\mathcal{L}$-list q-set colorable for every p-assignment $\mathcal{L}$. The talk summarizes some recent results and open problems in this very riche field of research.

Decomposing complete directed graphs into fixed length directed cycles

BRIAN ALSPACH, Regina, Canada

The old problem of determining necessary and sufficient conditions for decomposing complete graphs of odd order or complete graphs of even order with a 1-factor removed into fixed length cycles recently has been completely solved. A natural extension is to try to solve the analogous problem for complete directed graphs. This talk deals with the current status of the latter problem.

Drawing nonplanar graphs in the plane

NATHANIEL DEAN, Houston, U.S.A.

Let D be a drawing of a graph G in the plane where any pair of edges may cross any number of times. Define an even edge of D to be an edge that is crossed an even number of times in D. First, we generalize two theorems of Tutte by proving the following result: if the even edges induce a 3-connected graph H and some planar embedding of H has at least one empty face, then G has a rectilinear drawing where the drawing inherited by H is a convex embedding and no edge of H is crossed. This leads to other results on drawing nonplanar graphs in the plane. We also present a mathematical programming formulation of the rectilinear crossing number problem along with data to evaluate its usefulness in solving some open problems.

Degenerate extremal problems

RALPH FAUDREE AND MIKLÓS SIMONOVITS, Memphis, U.S.A.

Turán type degenerate extremal problems are considered (i.e. the determination of the Turán type extremal number $\mathrm{ext}(n, L)$ for a bipartite graph L). For a bipartite graph L with a fixed 2-coloring ψ and a positive integer k, let $L_k(L, \psi)$ denote the bipartite graph obtained from L by adding a new vertex v along with vertex disjoint paths with $k - 1$ edges from v to each vertex in one of the color classes of L. Bounds (which can be shown to be exact in some cases) on the extremal number $\mathrm{ext}(L_k(L, \psi))$ in terms of the extremal number $\mathrm{ext}(n, L)$ are given. When the graph L is a tree, these bounds are shown to imply some classical results in Turán type degenerate extremal theory. Also, these bounds are applied to the asymmetric degenerate extremal problem $\mathrm{ext}(m, n, F)$, which is the maximum number of edges in a bipartite graph with m and n vertices in the two parts respectively that contains no copy of F.

Freitag, 17.11.2000 — Zeit: 13.30

1 — Sektion I — Raum PK 14.3 — 13.30

On 10^{15} new simple 7-designs on 25 points

REINHARD LAUE, Bayreuth

A computer search by DISCRETA found more than 155 isomorphism types of simple 7-(24,11,840) designs and more than 28500 isomorphism types of simple 7-(24,12,2184) designs with automorphism group $PGL(2,23)$. They can be combined via Tran van Trung's and van Leijenhorst's construction to 7-(25,12,3024) designs. A recent analysis by the author of the isomorphism problem for this construction yields more than 10^{15} isomorphism types in this case. The new parameter sets can be combined with previously known ones to a family of 7-(v,k,λ) designs up to $(v,k)=(30,15)$.

2 — Sektion II — Raum PK 14.4 — 13.30

Chromatic number and regular factors

ARNE HOFFMANN, Aachen

We present sufficient conditions for a simple regular graph to have a regular factor. These conditions depend on the order, degree and the chromatic number of the graph and improve previously given bounds only depending on the order and the degree. Furthermore, we construct graphs of given chromatic number without a regular factor, showing that our conditions are best possible.

3 — Sektion III — Raum PK 14.6 — 13.30

The distribution of sequences in residue classes

CHRISTIAN ELSHOLTZ, Clausthal-Zellerfeld

We shall prove that any integer sequence $\mathcal{A} \subset [1,x]$ with counting function $A(x) \gg (\log x)^r$ lies modulo most primes $p \ll (\log x)^{r+1}$ in at least $\nu_{\mathcal{A}}(p) \gg p^{\frac{r}{r+1}}$ many residue classes. This generalizes a result of ERDŐS and RAM MURTY who proved in connection with ARTIN's conjecture on primitive roots that the integers below x which are multiplicatively generated by the coprime integers $a_1,\ldots,a_r$ (i.e. whose counting function is also $c(\log x)^r$) lie modulo most primes p in at least $p^{\frac{r}{r+1}+\varepsilon(p)}$ residue classes, where $\varepsilon(p)\to 0$, as $p\to\infty$.
We shall also mention applications to the prime k-tuple conjecture.

4 — Sektion IV — Raum PK 14.7 — 13.30

A deterministic polynomial time algorithm for Heilbronn's problem in dimension three

HANNO LEFMANN, Chemnitz

Heilbronn conjectured that among arbitrary n points in the 2-dimensional unit square $[0,1]^2$, there must be three points which form a triangle of area at most $O(1/n^2)$. This conjecture was disproved by a nonconstructive argument of Komlós, Pintz and Szemerédi who showed that for every n there is a configuration of n points in the unit square $[0,1]^2$ where all triangles have area at least $\Omega(\log n/n^2)$. Here we will consider a 3-dimensional analogue of this problem and we will give a deterministic polynomial time algorithm which finds n points in the unit cube $[0,1]^3$ such that the volume of every tetrahedron among these n points is at least $\Omega(\ln n/n^3)$.
This is joint work with Niels Schmitt, University of Bochum.

5 — Sektion V — Raum PK 14.8 — 13.30

Sum numbers for two types of cycle hypergraphs

HANNS-MARTIN TEICHERT, Lübeck

A hypergraph $\mathcal{H}$ is a *sum hypergraph* iff there are a finite $S \subseteq \mathbb{N}^+$ and $\underline{d},\overline{d} \in \mathbb{N}^+$ with $1 < \underline{d} \le \overline{d}$ such that $\mathcal{H}$ is isomorphic to the hypergraph $\mathcal{H}_{\underline{d},\overline{d}}(S) = (V,\mathcal{E})$ where $V = S$ and $\mathcal{E} = \{e \subseteq S : \underline{d} \le |e| \le \overline{d} \wedge \sum_{v\in e} v \in S\}$. For an arbitrary hypergraph $\mathcal{H}$ the sum number $\sigma = \sigma(\mathcal{H})$ is defined to be the minimum number of isolated vertices $y_1,\ldots,y_\sigma \notin V$ such that $\mathcal{H} \cup \{y_1,\ldots,y_\sigma\}$ is a sum hypergraph.
Generalizing the graph C_n we obtain *two types of cycle hypergraphs*. We determine sum numbers and investigate properties of sum labellings for these classes of hypergraphs.

*This research was supported by the Deutsche Forschungsgemeinschaft as part of the Sonderforschungsbereich "Computational Intelligence" (SFB 531).

Freitag, 17.11.2000 — Zeit: 14.00

6 — Sektion I — Raum PK 14.3 — 14.00

Recent existence and nonexistence results in design theory

PATRIC R. J. ÖSTERGÅRD, Helsinki, Finland

Computational methods for enumerating designs (and therefore also for proving nonexistence) are discussed. The methods used include backtrack search, clique finding in graphs, and orderly algorithms. New results are given for balanced incomplete block designs (BIBDs), resolvable BIBDs (RBIBDs), and Bhaskar Rao designs (BRDs). For example, there exists no (15,5,4) RBIBD. Another new result is that a BRD(16,4,2) exists and can be used to prove that a BRD$(v, 4, 2)$ with $v \equiv 4 \pmod 6$ exists for all but a finite number of possible exceptions. This is in part joint work with Malcolm Greig and Petteri Kaski.

7 — Sektion II — Raum PK 14.4 — 14.00

Knoten- und Listenknotenfärbungen ganzzahliger Distanzgraphen

MASSIMILIANO MARANGIO, Braunschweig

Ein ganzzahliger Distanzgraph $G(D)$ mit $D \subseteq \mathbb{N}$ ist ein Graph mit den ganzen Zahlen $\mathbb{Z}$ als Knotenmenge und Kanten zwischen allen Knoten u und v, für die $|u - v| \in D$ gilt. Mit $\chi(G)$ werde die chromatische Zahl und mit $\chi_l(G)$ die listenchromatische Zahl eines Graphen G bezeichnet.
Es gilt stets $\chi(G(D)) \leq \chi_l(G(D)) \leq |D| + 1$, doch wann wird die obere Schranke angenommen? Hierzu werden einige Ergebnisse und Vermutungen präsentiert.

8 — Sektion III — Raum PK 14.6 — 14.00

On a class of combinatorial diophantine equations related to the Meixner-Pollaczek polynomials

PETER KIRSCHENHOFER, Leoben, Austria

Let $p_n(x)$ denote the polynomials with the property that $p_n(k)$ is the number of all integer-coordinate lattice points $(x_1, \ldots, x_n)$ with $\sum_{i=1}^{n} |x_i| \leq k$. Using combinatorial arguments it is shown that the polynomials $i^n n! p_n(-1/2 - ix/2)$ form a Sheffer set of orthogonal polynomials, namely that they are a special instance of the Meixner-Pollaczek polynomials. Using these facts finiteness results on the number of solutions of the diophantine equation $p_n(x) = p_m(y)$ can be derived for the case where n and m have different parity. The technique can be used to prove similar results for more general combinatorially defined polynomial sequences.

9 — Sektion IV — Raum PK 14.7 — 14.00

On sets with many point-hyperplane incidences

PETER BRASS, Berlin

The incidence structure of sets of points and hyperplanes is a well-studied subject with applications in combinatorial and computational geometry. The question for the maximum number of incidences has, from dimension three on, a trivial answer: for n point and m hyperplanes, nm incidences are possible. But this maximum is reached only in a very degenerate situation: if all points lie in an affine subspace (e.g. on a line) and all hyperplanes contain that subspace. If we compress the description of the incidence structure by using a bipartite cover for these bipartite substructures, we get interesting problems. Improving earlier bounds by Erickson, we obtain an upper bound for the size of the incidence structure, and also a construction of a set with many incidences which does not contain any nontrivial bipartite substructure (so it has a 'complicated' incidence structure). The construction is related to some subsets of the integer lattice with few affine or linear dependencies, a generalization of the 'no-three-in-line' problem. This is joint work with C. Knauer.

10 — Sektion V — Raum PK 14.8 — 14.00

Difference labellings of cacti

MARTIN SONNTAG, Freiberg

It is known that many graphs (e.g. trees, cycles, complete graphs, ...) are difference graphs. For a large class of cacti, we describe an algorithm which can be used to construct difference labellings. The basic idea of the algorithm is the decomposition of a cactus into caterpillars and *hedgehogs* (:= cycles with additional end edges at some vertices). Composing special difference labellings of these caterpillars and hedgehogs we obtain a difference labelling of the cactus.

Freitag, 17.11.2000 — Zeit: 14.30

11 — Sektion I — Raum PK 14.3 — 14.30

On the asymptotic analysis of a class of linear recurrences

THOMAS PRELLBERG, Clausthal-Zellerfeld

Many problems in combinatorial enumeration lead to functional equations for a generating function $T(z)$ of the form $T(z) = a(z)T(f(z)) + b(z)$ I investigate the asymptotic growth of the coefficients of $T(z)$ in the case of $f(z)$ having a parabolic fixed point at zero. Applications range from the well-known Bell numbers to problems concerning the analysis of algorithms. In particular, I describe the asymptotic growth of the Takeuchi numbers, a problem posed by Don Knuth.

12 — Sektion II — Raum PK 14.4 — 14.30

Chromatic index critical graphs of order 14

DRAGO BOKAL AND GUNNAR BRINKMANN, Ljubljana, Slovenija

A graph G is chromatic index critical, iff it cannot be coloured with $\Delta(G)$ colours, but removing any edge from it yields a $\Delta(G)$-colourable graph. It is non-trivial, if it has less than $\Delta\lfloor\frac{n}{2}\rfloor$ edges. All chromatic index critical graphs of even order are non-trivial.

Beineke and Wilson (1973) and Jakobsen (1974) conjectured that all chromatic-index critical graphs have odd order. The conjecture was proven false by Goldberg (1981), who constructed an infinite family of 3-critical graphs of even order, the smallest having 22 vertices. The smallest known counterexample has 18 vertices and was found independently by Chetwynd and Fiol. Yap asked whether there are critical graphs of odd order less than 18. For graphs up to 10 vertices it was known that there were none and lately Brinkmann and Steffen showed that there are none on 12 vertices. In the talk it will be shown how we used computers to prove that there are none on 14 vertices and that all non-trivial graphs of odd order $n \leq 13$ come from the Petersen graph.

13 — Sektion III — Raum PK 14.6 — 14.30

General birth-death-dynamics in demographic cohorts

WALTER OBERSCHELP, Aachen

An obvious generalization of the Fibonacci recursion is to let the rabbits die after k time units.The linear recursion which results from this assumption requires for the asymptotic evaluation the calculation of the zeroes of the characteristic polynomial (of degree k). We solve this problem and thus answer a question which was raised by I. Schiermeyer. This solution has drawbacks concerning the intuition behind the model, since living objects can die only once. We have to change the approach: Using generating functions and thus following L.Euler (1760), P.H.Leslie (1945) and L.C.Cole (1954) in their demographic research, we give analytic solutions for the development of a starting cohort (assuming stationary reproduction and mortality). The main term is determined by the (real) main root of the reproduction polynomial, while mortality only influences the initial factor and not the asymptotic growth rate.

14 — Sektion IV — Raum PK 14.7 — 14.30

On Malfatti's packing

FERENC FODOR, Cookeville, U.S.A.

There is a family of problems about packing circles in a triangle. In particular, Malfatti's problem is concerned with finding three non-overlapping circular discs, not necessarily the same radius, in a triangle such that the sum of their areas is maximal. The same problem can also be posed for n circles. As of now, only the $n = 2$ case is solved. Malfatti originally provided an arrangement of 3 circles which proved not to be the optimal one. The greedy algorithm was conjectured to give a better packing for all triangles by Goldberg. In this talk, we give a proof of this conjecture.

15 — Sektion V — Raum PK 14.8 — 14.30

Subgraphs of high girth and large average degree

DANIELA KÜHN AND DERYK OSTHUS, Hamburg

It is well-known that there exist graphs which have both large average degree and large girth, i.e. graphs which locally look like a tree but are globally dense. C. Thomassen conjectured that in fact *every* sufficiently dense graph contains such a graph:

Conjecture *There exists a function $f(d,g)$ such that every graph of average degree at least $f(d,g)$ contains a subgraph of girth at least g and average degree at least d.*

In this talk I would like to discuss the conjecture and sketch our proof for the case $g \leq 6$. The general case of the conjecture is still open.

Freitag, 17.11.2000 — Zeit: 15.00

16 — Sektion I — Raum PK 14.3 — 15.00

Specialized colourings of Steiner systems and maximal arcs

ALEXANDER ROSA, Hamilton, Canada

Motivated by the recently introduced notion of the upper chromatic number, we consider colourings of Steiner systems $S(2,3,v)$ (=Steiner triple systems) and $S(2,4,v)$ in which blocks have prescribed colour patterns, as a refinement of classical weak colourings. The main question that we study is, given an integer k, does there exist a colouring of given type using exactly k colours? For several types of colourings a complete answer to this question is given, while for others only partial results are obtained. A connection to maximal arcs is exhibited. We also discuss the existence of uncolourable systems.

17 — Sektion II — Raum PK 14.4 — 15.00

Critically edge colourable planar graphs

ANDREA HACKMANN, Braunschweig

Vizing's theorem states that the chromatic index $\chi'(G)$ of a graph $G = (V, E)$ with maximum degree Δ either equals Δ or $\Delta+1$. The graph is called critical, if $\chi'(G) = \Delta+1$ and $\chi'(G-e) = \Delta$ for every edge $e \in E$. Since every graph with chromatic index $\Delta + 1$ contains a critical subgraph of the same maximum degree, results about graphs with chromatic index $\Delta + 1$ are often obtained by considering critical subgraphs.
So far, there exist lists of all critical graphs with $|V| \leq 8$ as well as $|V| = 9$ and $\Delta = 3$. The talk is about constructing all planar critical graphs of order $p \leq 12$.

18 — Sektion III — Raum PK 14.6 — 15.00

Constrained evolution of random graphs

DERYK OSTHUS, HANS JÜRGEN PRÖMEL AND ANUSCH TARAZ, Berlin

The classical model for the evolution of random graphs is the following: starting with the empty graph, at each timestep one randomly inserts a new edge. One of the remarkable discoveries about this model was the existence of so-called "threshold phenomena": for many graph properties there exists a critical time so that a random graph is very unlikely to have the property before this critical time and is extremely likely to have it shortly afterwards.
In this talk, I will briefly describe some results about what happens if we restrict our attention to the evolution of graphs subject to the constraint that they do not contain one or more forbidden subgraphs.
In particular, we prove that *almost all* graphs of high girth and suitable density have high chromatic number, which strengthens a classical result of Erdős.

19 — Sektion IV — Raum PK 14.7 — 15.00

Improved sphere bounds in finite metric spaces by decompositions of the underlying space

JÖRN QUISTORFF, Hamburg

Sphere bounds are frequently used to estimate the cardinality of extremal sets solving packing or covering problems in finite metric spaces. The improvement of such bounds by decompositions of the underlying space is observed. Thereby the presently known lower bounds on $K_5(7,3)$ and $K_4(9,4)$, denoting the cardinality of minimal codes in covering problems provided with the Hamming metric, are sharpened.

20 — Sektion V — Raum PK 14.8 — 15.00

Unique minimum dominating sets of graphs

MIRANCA FISCHERMANN AND LUTZ VOLKMANN, Aachen

For any graph G with vertex set $V(G)$ and for two subsets X and D of $V(G)$ the set D is an X-dominating set of G, if every vertex of X either is in D or has at least one neighbor in D. A $V(G)$-dominating set is called a dominating set of G. A dominating set and an X-dominating set of G of minimal cardinality is called a minimum dominating set and a minimum X-dominating set of G, respectively. Gunther, Hartnell, Markus, and Rall have characterized all trees with unique minimum dominating sets. We generalize this result for unique minimum X-dominating sets. Further, we present characterizations for block graphs and for cactus graphs with unique minimum dominating sets.

Freitag, 17.11.2000 — Zeit: 15.30

21 — Sektion I — Raum PK 14.3 — 15.30

Size Ramsey numbers of stars versus bipartite graphs

OLEG PIKHURKO, Cambridge, UK

We investigate the size Ramsey number of the n-star K_{1n} versus a fixed bipartite graph F as n tends to infinity.

22 — Sektion II — Raum PK 14.4 — 15.30

A partial solution of Vizing's planar graph conjecture

STEFAN GRÜNEWALD, Bielefeld

For a graph G, a well known theorem states that $\Delta \leq \chi' \leq \Delta + 1$, where Δ and χ' denote the maximum degreeand chromatic index of G, respectively. If $\chi' = \Delta + 1$, then G is said to be in class 2, otherwise it is in class 1. Vizing's planar graph conjecture from 1965 states that every planar graph with maximum degree $\Delta \geq 6$ is in class 1. Vizing also proved the case $\Delta(G) \geq 8$. There are planar class 2 graphs known with maximum degree 2, 3, 4, and 5, respectively. Hence, the two cases $\Delta = 6$ and $\Delta = 7$ remain. We derive some new structural properties for graphs which are critical with respect to edge coloring. By applying these properties and the discharging method, we prove the planar graph conjecture for $\Delta = 7$.

23 — Sektion III — Raum PK 14.6 — 15.30

On distance in the rotation graphs of labeled and unlabeled trees

STIJN LIEVENS, VEERLE FACK AND JORIS VAN DER JEUGT, Ghent, Belgium

A generalized binary coupling tree is an unordered binary tree in which each leaf has a label. A "rotation" on these generalized binary coupling trees can be defined and used to define generalized rotation graphs. In this talk we investigate some properties of these generalized rotation graphs, such as minimum and maximum degree, diameter and radius, ...
For some special cases (e.g. when all the leaves have the same label), we obtained the exact value of minimum and maximum degree of the rotation graphs and found which nodes (i.e. which generalized binary coupling trees) achieve these extremal values.
For some of the smallest rotation graphs the exact diameter is known. We give reasonable bounds for the diameter of some generalized rotation graphs, in particular when all leaves have a distinct label, and when there are only one or two distinct labels.

24 — Sektion IV — Raum PK 14.7 — 15.30

Packing a convex domain with nonequal circles

GERD BLIND, Stuttgart

In the Euclidean plane, consider a packing of $n \geq 2$ circles $K_1, \ldots, K_n$ in a convex domain T, and let the radii of the circles be $\varrho_1, \ldots, \varrho_n$, respectively. Then, clearly, the density of such a packing may be arbitrarily close to 1. However, if the radii of the circles are not too different, that is, if $0.742991 \leq \varrho_1, \ldots, \varrho_n \leq 1$, it is well-known that in the particular case of a convex 6-gon T the density of such a packing is smaller than $\pi/\sqrt{12}$, the density of the densest packing of equal circles in the plane.
We show that this result is true for every convex T.

25 — Sektion V — Raum PK 14.8 — 15.30

On a problem of Erdős and Sárközy

TOMASZ SCHOEN, Kiel

Let $A = \{a_1, a_2, \ldots\} \subseteq \mathbf{N}$ and put $A(n) = \sum_{a_i \leq n} 1$. We say that A is a P-set if no element a_i divides the sum of two larger elements. It is proved that for every P-set A with pairwise co-prime elements the inequality

$$A(n) < 2n^{2/3}$$

holds for infinitely many $n \in \mathbf{N}$.

Freitag, 17.11.2000 — Zeit: 16.30

26 — Sektion I — Raum PK 14.3 — 16.30

Ramsey numbers for parallel colorings

STEFAN KRAUSE, Braunschweig

In classical Ramsey theory for graphs one asks for the smallest order of a complete graph, so that every edge-coloring contains a given graph G in the first color, or a given graph H in the second color. In this talk I will discuss a weakened Ramsey-condition. The idea is to demand only that a special class of edge-colorings contains a given monochromatic subgraph. These special colorings are constructed as follows. The K_n is drawn as a regular n-gon and edges which are parallel receive the same color.

27 — Sektion II — Raum PK 14.4 — 16.30

Critical connectivity of graphs and domination in hypergraphs

MATTHIAS KRIESELL, Hannover

A finite, simple, undirected *graph* G is called *k-critically n-connected* or, briefly, an (n,k)-*graph*, if G is non–complete, n-connected, and $G - X$ is not $(n - |X| + 1)$-connected for every $X \subseteq V(G)$ with $|X| \leq k$.
In 1993, SU proved that there exists no (n,k)-graph for $n < 2k$, which has been conjectured by MAURER and SLATER in 1977. The sustainable attacks to this ex–conjecture led to further conjectures on (n,k)-graphs; for example, MADER conjectured in 1984 that every (n,k)-graph with $n < 4k$ must contain a vertex of degree n, and that for each $k \geq 3$ the graph obtained from K_{2k+2} by removing a set of $k+1$ independent edges is the *unique* $(2k,k)$-graph. I will present recent results on (n,k)-graphs and will show how estimations to the transversal number of certain hypergraphs can be used in that field.

28 — Sektion III — Raum PK 14.6 — 16.30

On two combinatorial problems in a propositional logic framework

BERT RANDERATH, Köln

A level graph can be defined as a DAG $G = (V, E)$ with an additional level-function $l : V \to \{1, ..., k\}$, s. t. arcs $u \to v$ always are directed from nodes at level $l(u)$ to nodes at a higher level $l(v) > l(u)$. An embedding of a level graph G assigns to every node u with level $l(u) = y$ a unique point $(x(u), y)$ in the plane. I. e. all nodes u at same level y are placed on a line parallel to the x-axis at distance y. Testing level graphs for a level-planar embedding has recently been shown to be solvable in linear time by an involved algorithmic approach due to S. Leipert.
In this talk a formulation of this embedding problem in terms of CNF-formulas is presented. The advantage of this approach is the simplicity and the non layer-to-layer-sweep fashion of this algorithm.
Secondly, we consider graph classes for which the question of 3-colourability cting subgraphs.

29 — Sektion IV — Raum PK 14.7 — 16.30

The millennium edge and 100 years Georges Brunel

HARALD GROPP, Heidelberg

This year's *Kombinatorikkolloquium* in Braunschweig is a very special one; it is the last one in this millennium. For some people it is already the first one in the third millennium. The first part of my talk will be on this millennium edge between the second and the third millennium of our era.
The second part will be on the life and work of Georges Brunel (1856-1900), a French mathematician, who died 100 years ago. Brunel can be considered as a pioneer in early graph theory. Unfortunately, he is nearly unknown today.
Brunel was very much motivated by applications of graphs in chemistry, he developed adjacency matrices. Moreover he discussed the partition of complete graphs into cliques and cycles; in particular he worked on Steiner systems and configurations.

30 — Sektion V — Raum PK 14.8 — 16.30

In how far does the boundary of a patch determine its interior?

ULRIKE VON NATHUSIUS AND GUNNAR BRINKMANN, Bielefeld

In this talk we will discuss (m,k)-patches, i.e. 2-connected planar graphs where every inner face is a k-gon, every inner vertex has degree m and vertices on the boundary have degree at most m.
For some parameters (m,k) these graphs correspond to molecules studied in chemistry, the most important ones being benzenoids, that is $(3,6)$-patches which can be embedded into the hexagonal lattice. Benzenoids can be uniquely described and therefore efficiently encoded by giving the boundary code. This encoding was also proposed for general $(3,6)$-patches (chemical name: fusenes). A counterexample showing that the code does not uniquely determine the interior was given by M. ZHENG in 1998. It was observed that in all known examples where different patches had the same boundary the number of faces was the same. In our talk we will prove that this is true in general: For every m, k the boundary of a patch uniquely determines the number of faces in its interior.

Freitag, 17.11.2000 — Zeit: 17.00

31 — Sektion I — Raum PK 14.3 — 17.00

Ramsey-Turán type problems

STEPHAN BRANDT, Berlin

The classical Ramsey number $R(r, s)$ denotes the maximal order minus one of a K_r-free graph with independence number at most s. The Turán number $t_{r-1}(n)$ denotes the maximal size of a K_r-free graph of order n. The Ramsey-Turán number $RT(n; r, f(n))$ denotes the maximal size of a K_r-free graph of order n with independence number at most $f(n)$, a suitable function of n. An early Ramsey-Turán type problem was to maximize $RT(n; r, f(n))$ over all functions $f(n) = o(n)$. This problem was finally asymptotically solved by Erdős and Sós (1970) for odd r, and by Szemerédi (1972), Bollobás and Erdős (1976), and Erdős, Hajnal, Sós and Szemerédi (1983) for even r, the latter by applying Szemerédi's regularity lemma.

In my talk, this problem and the related problem for the maximal minimum degree will be investigated for $f(n) = cn$, $c > 0$. Asymptotically exact bounds will be given for a large range of values of c if $r = 3$. For the related degree problem tight bounds will be given for a large range of c if r is odd, and for the largest values of c if r is even.

32 — Sektion II — Raum PK 14.4 — 17.00

The fractional flow number of an orientable matroid

WINFRIED HOCHSTÄTTLER, Clausthal-Zellerfeld

The circular chromatic number $\chi^*(G)$ of a graph, introduced by A. Vince as star chromatic number, is a non-negative rational number satisfying $\lceil \chi^*(G) \rceil = \chi(G)$ where $\chi(G)$ is the chromatic number. Goddyn, Tarsi and Zhang introduced the matroid dual $\phi^*(G)$ of this parameter, which we call the fractional flow number, generalized its definition to general orientable matroids and asked whether this parameter is bounded for matroids of bounded rank. We answer this question to the affirmative.
(joint work with L. Goddyn and P. Hliněny).

33 — Sektion III — Raum PK 14.6 — 17.00

An algorithm for constructing Hadamard matrices

FRANZ HERING, Dortmund

We define a new class of Hadamard matrices and present some examples obtained by an algorithm using a computer program.

34 — Sektion IV — Raum PK 14.7 — 17.00

Infeasibility of systems of inequalities

STEFAN FELSNER, Berlin

Let $Mx < b$ be a system of n linear inequalities in d variables. The *infeasibility* of $p \in R^d$ is the number of inequalities in $Mp < b$ that are violated. An infeasible subsystem of $Mx < b$ is a subset of the inequalities admitting no feasible point. The following inequality holds:

$$\min(\text{ infeasibility of } p\ ) \geq \max(\#\text{ of disjoint infeasible subsystems })$$

We are interested in constants C_d so that:

$$\min(\text{ infeasibility of } p\ ) \leq C_d \cdot \max(\#\text{ of disjoint infeasible subsystems })$$

Using methods from combinatorial geometry we find the best possible constants for several cases.

35 — Sektion V — Raum PK 14.8 — 17.00

Approximately covering by cycles in a planar graph

DIETER RAUTENBACH AND BRUCE REED, Aachen

Let $G = (V(G), E(G))$ be a graph and let $\mathcal{C}$ be the collection of its cycles. Let $p : E(G) \to \mathbf{Z}_0^+$ be a non-negative, integer-valued function on its edge set.
The CYCLE COVER PROBLEM is the optimization problem of finding a multiset α of cycles of G such that each edge $e \in E$ is in at least $p(e)$ of the cycles in α and such that the sum of the lengths of all cycles in α is minimum.
We will show how to approximate within a factor of 8 the optimum value of the cycle cover problem for planar graphs in polynomial time.

Freitag, 17.11.2000 — Zeit: 17.30

36 — Sektion I — Raum PK 14.3 — 17.30

New Ramsey numbers for cycles

INGO SCHIERMEYER, Freiberg

Conjecture 1 (Bondy and Erdös, 1971)
For all odd natural numbers $k \geq 5$,

$$r(C_k, C_k, C_k) = 4k - 3.$$

Together with R. Faudree and A. Schelten we have proved this conjecture for $k = 7$, i.e. $r(C_7, C_7, C_7) = 25$.
Conjecture 2 (Erdös, Faudree, Rousseau and Schelp, 1978)
For all natural numbers $m \geq n \geq 3$ (except $r(C_3, K_3) = 6$),

$$r(C_m, K_n) = (m-1)(n-1) + 1.$$

This conjecture holds for $3 \leq n \leq 5$. We will present a proof for $n = 6$ and for all $n \geq 7$ with $m \geq n^2 - 2n$.

37 — Sektion II — Raum PK 14.4 — 17.30

Which cubic graphs are Yutsis graphs?

DRIES VAN DYCK AND VEERLE FACK, Gent, Belgium

A binary coupling tree on $n+1$ leaves is an unordered binary tree in which each leaf has a distinct label. A Yutsis graph of order n consists of two binary coupling trees on $n+1$ leaves, in which the unique leaf edges with the same label are identified. In addition both root nodes are connected by an additional edge. The leaf nodes themselves disappear from the graph. The graph thus obtained is cubic and has $2n$ nodes and $3n$ edges. Moreover it has the property that it contains an edge-cut on $n+2$ edges that separates the graph into two trees of equal size.
Yutsis graphs appear in the context of quantum theory where they represent a 3nj-coefficient. The binary coupling trees correspond to the coupling schemes in the bra/kets of the 3nj-coefficient. In this talk we study the characterization of Yutsis graphs as a subset of the set of cubic graphs. We show how Yutsis graphs can be generated by means of a recursive procedure. We also describe some classes of cubic graphs that cannot be Yutsis graphs.

38 — Sektion III — Raum PK 14.6 — 17.30

Das Zuverlässigkeitsüberdeckungsproblem

KLAUS DOHMEN, München

In der Zuverlässigkeitstheorie interessiert man sich häufig für die Wahrscheinlichkeit, dass eine technische Anlage mit ausfallbehafteten Komponenten fehlerfrei funktioniert. In einem Kommunikationsnetz beispielsweise, dessen Vermittlungsstellen und/oder Verbindungsleitungen ausfallbehaftet sind, interessiert man sich häufig für die Wahrscheinlichkeit, dass je zwei Teilnehmer miteinander kommunizieren können.
Üblicherweise werden technische Anlagen mit ausfallbehafteten Komponenten als monotone binäre Systeme modelliert. Weniger bekannt, aber dennoch in einem gewissen Sinne gleichmächtig, ist das 1991 von Ball, Provan und Shier eingeführte Hypergraphenmodell, bei dem die Knoten ausfallfrei und die anten ausfallbehaftet sind und die gesuchte Größe die Wahrscheinlichkeit ist, dass die gesamte Knotenmenge von den intakten Kanten überdeckt wird.
Im Vortrag wird ein Polynomzeitalgorithmus für eine spezielle Hypergraphenklasse vorgestellt.

39 — Sektion IV — Raum PK 14.7 — 17.30

40 — Sektion V — Raum PK 14.8 — 17.30

Stable sets with given properties

VAN BANG LE, Rostock

We survey known results and discuss open questions concerning the existence of a stable set S in a graph G such that $G - S$ has a given property, such as being disconnected, H-free etc.

Sonnabend, 18.11.2000 — Zeit: 13.30

41 — Sektion I — Raum PK 14.3 — 13.30

Toughness and minors in graphs

THOMAS BÖHME, Ilmenau

A connected graph G is *t-tough* if for every separating vertex set S, the subgraph $G - S$ of G has at most $|S|/t$ connected components. Furthermore, let P_k^d denote the dth power of a path on k vertices.
Recently, T. Böhme, B. Mohar, and B. Reed [3] proved the follwoing theorem which is a modification of earlier results of T. Böhme, B. Mohar, and J. Maharry [1,2].

Theorem 1 (Böhme, Mohar, and Reed). *For any positive integers d and k there exist numbers $t = t(d)$ and $N = N(k, d)$ such that every t-tough graph of order at least N contains P_k^d as a minor.*

[1] T. Böhme, J. Maharry, and B. Mohar, $K_{a,k}$ minors in graphs of bounded tree-width, submitted.
[2] T. Böhme, J. Maharry, and B. Mohar, Unavoidable minors in large 7-connected graphs, in preparation.
[3] T. Böhme, B. Mohar, and B. Reed, Unavoidable minors in large t-tough graphs, in preparation.

42 — Sektion II — Raum PK 14.4 — 13.30

New short proofs of Menger's Graph Theorem

FRANK GÖRING, Ilmenau

Three new and short proofs of Menger's classical graph theorem concerning the number of disjoint AB-paths will be given. One of them is an algorithmical proof which works even in the case that the considered graph is infinite (but has a finite separator). Furthermore, a theorem obtained from Menger's Theorem which has many forms of Menger's Theorem and some classical results of transversal theory as special cases will be proved.
Erdős's conjecture, that there is always an AB-separator and a system of disjoint AB-paths such that every path of the system contains exactly one vertex of the separator, remains open in the case that the separator is infinite.

43 — Sektion III — Raum PK 14.6 — 13.30

Pseudo models and propositional Horn inference

BERNHARD GANTER, Dresden

Pseudo models can be defined for arbitrary finite set systems. But it seems that their (recursive) definition is not very intuitive. We give an instructive example and show how pseudo models can be used in elementary logic: to efficiently decide propositional Horn inference in the presence of a fixed amount of non-Horn background knowledge.
A simple unsolved problem is if pseudo model recognition is in $\mathcal{NP}$.

44 — Sektion IV — Raum PK 14.7 — 13.30

Ein chromatisches Unabhängigkeitspolynom

PETER TITTMANN, Mittweida

Klaus Dohmen führte in seiner Habilitationsschrift eine Verallgemeinerung des chromatischen Polynoms ein. Sei $G = (V, E)$ ein ungerichteter Graph. Das verallgemeinerte chromatische Polynom $P(G; x, y)$ ist die Anzahl aller Färbungen der Knoten von G mit x Farben, wobei zwei adjazente Knoten unterschiedlich gefärbt sein müssen, wenn sie beide eine der ersten y ($y \leq x$) Farben erhalten haben. Diese Polynom besitzt viele interessante Eigenschaften. Als Entwicklung von $P(G; x, y)$ erhält man das chromatische Polynom und das Unabhängigkeitspolynom eines Graphen, es ist jedoch selbst keine Entwicklung aus dem Tutte-Polynom. Für Wege, Kreise, vollständige und vollständige bipartite Graphen erhält man geschlossene Formeln für das verallgemeinerte chromatische Polynom. In Bäumen ist es in polynomialer Zeit berechenbar.

45 — Sektion V — Raum PK 14.8 — 13.30

On the computation of alternatives in combinatorial optimization problems

INGO ALTHÖFER, Jena

Two related topics will be discussed: (a) K-Best algorithms are not too useful in applications when the k best solutions are merely micro mutations of each other instead of true alternatives. K-Choice algorithms may help which generate good alternatives one by one, banning or punishing those solutions which are too similar to previously generated candidates. "Road detection in satellite images" is given as an example application. (b) Evaluation of candidates and listing by decreasing values is a basic technique in decision support systems. Such candidate listing may also be used in data compression. We want to discuss similarities and differences between both applications. The solitair game FREECELL (known from Windows 95 and 98) is used for exemplification.

Sonnabend, 18.11.2000 — Zeit: 14.00

46 — Sektion I — Raum PK 14.3 — 14.00

Closure concepts and local properties of graphs

ROMAN ČADA, Plzeň, Czech Republic

We introduce some closure concepts (for general graphs) based on a local structure of graph. We present a method generating unique closure concepts of this type from a nonunique one's. We will deal with stability of hamiltonian properties. We show the role of local connectivity in stability of following properties: longest cycle, path, u-path, uv-path. As an application we obtain a sufficient condition for cyclability.
These results generalize previous results by Broersma & Trommel, Ryjáček and Saito & Bolobás & Riordan & Ryjaáček & Schelp.

47 — Sektion II — Raum PK 14.4 — 14.00

Orthogonal double covers of $K_{n,n}$

MARTIN GRÜTTMÜLLER, Rostock

An orthogonal double cover (ODC) of K_n is a collection of graphs such that each edge of K_n occurs in exactly two of the graphs and two graphs have precisely one edge in common. ODCs of K_n and their generalizations have been extensively studied by several authors.
We will investigate ODCs where the graph to be covered twice is $K_{n,n}$ and all graphs in the collection are isomorphic to a given graph G. El-Shanawany, Gronau and Grüttmüller have shown that there exists an ODC of $K_{n,n}$ by all proper subgraphs G of $K_{n,n}$ for $2 \leq n \leq 9$, with two genuine exceptions. Most of the ODCs are cyclically generated.
In this talk, we will present a construction for graphs which do not admit a cyclic solution.

48 — Sektion III — Raum PK 14.6 — 14.00

Construction and characterization of divisible designs

SABINE GIESE, Berlin

We construct series of divisible designs by using the Spera Construction. Starting from an ovaloid in the infinite hyperplane of a 4-dimensional affine space we get series of 2- and 3-divisible designs which admit orthogonal groups as automorphism groups.
On the other hand a divisible design with a dual translation group can be described up to isomorphism by a divisible design whose

- points are affine subspaces,
- pointclasses are parallelclasses and
- blocks are transversal subsets of these affine subspaces.

49 — Sektion IV — Raum PK 14.7 — 14.00

The chromatic number of some rational spaces

MATTHIAS MANN, Bielefeld

The chromatic number χ of rational n-space is the chromatic number of the infinite graph U_n whose vertex set is the set of all those n-dimensional vectors with all the coordinates being rational numbers and with two vertices forming an edge iff the Euclidian distance is one.
The problem remains open for $n \geq 5$. For these dimensions K. B. Chilakamarri and Joseph Zaks proved lower bounds. Chilakamarri stated that $\chi(U_5) \geq 6$.
In the lecture we are going to improve at least the result for $n = 5$ and describe how to find tunit distance graphs.

50 — Sektion V — Raum PK 14.8 — 14.00

AT-free, coAT-free graphs

EKKEHARD KÖHLER, Berlin

We consider structural and algorithmic properties of two graph classes which share the property that they are on the one hand generalizations of permutation graphs, on the other hand subfamilies of AT-free graphs. First we consider graphs that are both *AT-free and coAT-free*. We show that the number of minimal separators in an AT-free, coAT-free graph is bounded by a polynomial in the number of vertices of the graph. From this it follows that problems like TREEWIDTH, PATHWIDTH, MINIMUM FILL-IN, MINIMUM INTERVAL GRAPH COMPLETION, and VERTEX RANKING become solvable in polynomial time for AT-free, coAT-free graphs. In the second part we study *AT-free posets*, i.e. comparability graphs not containing an asteroidal triple. We study the relationship between dominating pair vertices and potential extremal elements (i.e. minimal or maximal elements) of a given AT-free poset. Furthermore we suggest an ordering that visualizes the overall structure of AT-free posets.

Sonnabend, 18.11.2000 — Zeit: 14.30

51 — Sektion I — Raum PK 14.3 — 14.30

Matchings and P_3-partitions motivated by process control

Zsolt Tuza, Budapest, Hungary

We study the following restricted type of graph partitions into paths P_3 of length two. Let $G = (V, E)$ be a graph with a given vertex partition $X \cup Y = V$, such that X is an independent set and $|Y| = 2|X|$. Partition G into vertex-disjoint copies of P_3 in such a way that each part has precisely one vertex in X. The P_3 need not be induced subgraphs, i.e. they are allowed to induce triangles.
There is a variety of questions one can raise, including the time complexity of deciding whether such a partition exists, necessary and/or sufficient conditions on the existence, etc. While on unrestricted instances the problem is NP-hard, it remains an interesting open question to describe large graph classes admitting solution in polynomial time.
The original problem has occurred in the process control of dynamic systems, modelled by digraphs. The present variant corresponds to the case of Single Input Double Output controllers.
This is a joint work with K. M. Hangos and A. Yeo.

52 — Sektion II — Raum PK 14.4 — 14.30

Equivalence of Fleischner's and Thomassen's conjectures

Martin Kochol, Bratislava, Slovakia

We show that conjectures of Thomassen (every 4-connected line graph is hamiltonian) and Fleischner (every cyclically 4-edge-connected cubic graph has either an edge-3-coloring or a dominating cycle) are equivalent.

53 — Sektion III — Raum PK 14.6 — 14.30

Extremal problems under dimension constraint

Harutyun Aydinian, Bielefeld

The extremal set theory deals with the characterization of optimal set systems under certain restrictions. Representing set systems by their characteristic vectors or by incidence matrices we can speak about dimension of a set system. The main aim of our talk is to present a series of extremal problems (like antichain problem, intersection problems, etc.) under dimension restriction. We also touch one of them: antichain problem.

54 — Sektion IV — Raum PK 14.7 — 14.30

On the chromatic polynomial

Bodo Lass, Aachen

The number of colourings of the vertices of a simple graph G with λ colours such that no two adjacent vertices get the same colour is a polynomial $\chi_G(\lambda)$ called the chromatic polynomial. By Stanley's theorem $\chi_G(-1)$ equals the number of acyclic orientations of G, however, there are many more (old and new) relations between acyclic orientations and the chromatic polynomial. We want to prove them in a new way, emphasizing the method rather than the results.

55 — Sektion V — Raum PK 14.8 — 14.30

Reconstruction of phylogenetic trees from DNA-Data (and edge-colourings of K_5 and K_6)

Jan Weyer-Menkhoff, Bielefeld

Given a family of related genomic sequences, we assume that, for each quadruple of sequences, the most likely one of the three possible unrooted trees (called quartet trees and symbolized by $ab \mid cd$, $ac \mid bd$ and $ad \mid bc$ for the quadruple a,b,c,d) that represent the putative family relationship between these four sequences has been chosen. Because of noise in the data, we usually cannot construct a tree for the whole family of sequences that displays all of these quartet trees.
In this talk, we study collections of quartet trees - one for each quadruple - which satisfy the transitivity condition $ab \mid cd \,\&\, ab \mid de \Rightarrow ab \mid ce$. These sets of quartets we call thin transitive covers (ttc). We show that they can be constructed from binary trees and from ttc's on five or six sequences related to minimal edge-colorings of K_5 and K_6. All ttc's on five sequences correspond to an edge of the Petersen-Graph or to a matching of it. A simple geometric interpretation of this fact will be given. As a consequence of this classification of ttc's, it will be shown that ttc's correspond in one-to-one manner to leave-labelled trees with internal vertices of degree 3, 5, or 6 together with 'ornamentations' of the 5- and 6-degree vertices in form of minimal edge colourings of the complete graph defined on the set of edges incident with such a vertex. This is joint work with A. Dress.

Sonnabend, 18.11.2000 — Zeit: 15.30

56 — Sektion I — Raum PK 14.3 — 15.30

Acyclic orientations of mixed graphs and the xyz-inequality

MICHAEL NAATZ, Berlin

A mixed graph is a simple graph in which some of the edges additionally have a direction. An acyclic orientation is an assignment of directions to all undirected edges such that the resulting digraph is acyclic. Suppose we are given a mixed graph G with vertices x, y and z, such that x is joined to both y and z by undirected edges. We choose an acyclic orientation A of G uniformly at random. Intuition now suggests that if A contains an arc from x to z, it should be more likely that it also contains the arc from x to y, i.e., $\Pr(x \to y)$ should not be greater than $\Pr(x \to y \mid x \to z)$. A classical combinatorial result, the so-called xyz-inequality, ensures that this is true when G contains an edge (directed or undirected) between each pair of vertices. We give some results for other kinds of mixed graphs and indicate connections to the classical case.

57 — Sektion II — Raum PK 14.4 — 15.30

Degree bounds for the circumference of 3-connected graphs

HEINZ ADOLF JUNG AND AIERKEN WUMAIER, Berlin

We call the graph G exceptional, if there exist vertices x_1, x_2, x_3 in G such that $G - \{x_1, x_2, x_3\}$ has at least 4 components and all components of $G - \{x_1, x_2, x_3\}$ are hamiltonian connected.
If C is a longest cycle in the 3-connected graph G which is not exceptional, then either all components of $G - V(C)$ have at most two vertices or $|C| \geq 2d(u) + 2d(w) - 8$ for some pair of non-adjacent vertices u, w in G. Also the exceptional class is determined for the stronger estimate $|C| \geq 2d(u) + 2d(w) - 4$.

58 — Sektion III — Raum PK 14.6 — 15.30

Hunting posets

GUNNAR BRINKMANN AND A. KRAUSE, Bielefeld

Since 1972 various authors have developed and implemented algorithms for the constructive enumeration of all (unlabeled) posets for a given number of points. In 1999 Heitzig and Reinhold presented their algorithm at the *Kolloquium über Kombinatorik*. It was the most efficient algorithm at that time and was able to list 30 000 posets per second on a 450 MHZ DEC Alpha and – parallelized to run on a Cray T3e – gave a complete listing of all posets on 14 points.
Inspired by this talk we developed a new algorithm that we will present in our talk. It lists about 1 500 000 posets on 14 points per second on a 450 MHZ Pentium III Linux PC and was used to construct all posets on 15 points on a cluster of Linux PCs. The number of posets listed per second is increasing with the number of points.

59 — Sektion IV — Raum PK 14.7 — 15.30

Symmetrisierungsprozesse für Hüllenoperatoren

HORST MARTINI AND WALTER WENZEL, Chemnitz

Einem auf einer beliebigen nichtleeren Menge E definierten Hüllenoperator wird durch einen Iterationsprozeß ein Hüllenoperator zugeordnet, der die symmetrische Austauscheigenschaft besitzt. Ist E endlich, so erhält man auf diese Weise eine Matroidstruktur. Für unendliche Mengen E ist die Zahl der benötigten Iterationen im allgemeinen ebenfalls unendlich.
Ist E ein Euklidischer Vektorraum, so wird durch das Verfahren dem konvexen Hüllenoperator der affine Hüllenoperator zugeordnet. Schließlich wird der Symmetrisierungsprozeß auch angewandt auf gewisse Hüllenoperatoren, die bei der Untersuchung von Beleuchtungsproblemen eine Rolle spielen.

60 — Sektion V — Raum PK 14.8 — 15.30

CaGe – a graph generating, embedding and visualizing environment

SEBASTIAN LISKEN, Bielefeld

This talk presents the software package CaGe, which brings together several independent programs in order to * generate simple graphs, * "embed" these graphs in 2D or 3D space (i.e., assign coordinates to their vertices) and * visualize the resulting structures. The project was motivated from graph theory as well as chemistry, where embedded graphs are interpreted as molecules; some of our generators specifically address chemical interests. It is freely available, the current version runs under UNIX on a Tcl/Tk and C platform. CaGe's website is "http://www.mathematik.uni-bielefeld.de/ CaGe/".

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