Programm 9. SEG Workshop am 28. Juni 2011

From spanning forests to edge subsets (15:00 Uhr)

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We give some insight into Tutte's definition of internally and externally active edges for spanning forests. Namely we prove, that every edge subset can be constructed from the edges of exactly one spanning forest by deleting a unique subset of the internally active edges and adding a unique subset of the externally active edges.

On minimally rainbow k-connected graphs (15:30 Uhr)

Ingo Schiermeyer (Technische Universität Bergakademie Freiberg)
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An edge-coloured graph G is *rainbow connected* if any two vertices are connected by a path whose edges have distinct colours. A graph G is called *rainbow k-connected*, if there is an edge-colouring of G with k colours such that G is rainbow-connected.

In this talk we will study rainbow k-connected graphs with a minimum number of edges. For an integer $n \geq 3$ and $1 \leq k \leq n-1$ let $t(n,k)$ denote the minimum size of a rainbow k-connected graph G of order n. We will compute exact values and upper bounds for $t(n,k)$.

Pause (16:00 Uhr)

Netzwerkflussspanner (16:45 Uhr)

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In der algorithmischen Graphentheorie sind bereits einige Probleme bekannt, bei denen es darum geht, zu einem gegebenen Netzwerk ein kostengünstiges Teilnetzwerk zu finden, in dem der maximale Fluss zwischen jedem Quelle-Senke-Paar möglichst groß ist. Im Vortrag werden sogenannte Netzwerkflussspanner vorgestellt. Es wird gezeigt, dass für Netzwerke, denen ein Graph mit einer Baumweite von höchstens 2 zugrundeliegt, das Netzwerkflussspannerproblem für Einheitskapazitäten und Einheitskosten auf allen Kanten in polynomieller Zeit gelöst werden kann.

Planar hypohamiltonian graphs (17:15 Uhr)

Carol T. Zamfirescu (TU Dortmund, Germany)
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A graph is called *hypohamiltonian* if it is not hamiltonian but, when omitting an arbitrary vertex, it becomes hamiltonian. The smallest hypohamiltonian graph is the famous Petersen graph (found by Kempe in 1886) on 10 vertices. In 1963, Sousselier posed a problem of recreational nature, and thus began the study of hypohamiltonian graphs. Many authors followed, in particular Thomassen with a series of very interesting papers written in the Seventies and Eighties. For more details, see the survey by Holton and Sheehan [4].

Among the work concerning hypohamiltonian graphs, Chvátal [1] asked in 1973 if there existed hypohamiltonian graphs with the additional requirement of planarity, while Grünbaum conjectured that there are no such graphs. An infinite family of such graphs was subsequently found by Thomassen [5], the smallest among them having 105 vertices. In 1979, Hatzel [3] improved this lower bound to 57 vertices. Many years later, in 2007, Zamfirescu and Zamfirescu [8] found a planar hypohamiltonian graph on 48 vertices, and only very recently Araya and Wiener [7] constructed the currently smallest known example, which has 42 vertices. All these graphs, extremal in the sense of minimal order, were constructed by applying Grinberg's hamiltonicity criterion for planar graphs [2]. This leads to the natural question whether one might construct even smaller planar hypohamiltonian graphs with Grinberg's criterion.

In this talk we shall investigate the pivotal role of Grinberg's criterion in the context of planar hypohamiltonian graphs, and present a result answering (partially) the above question in the negative. We will also discuss the recent constructions in [7], which by applying a method of Thomassen [6] and results from [3] and [8] settle the open question whether there exists an N such that there is a planar hypohamiltonian graph of every order $n \geq N$.

References

[1] V. Chvátal, Flip-Flops in Hypohamiltonian Graphs, *Canad. Math. Bull.* **16** (1973) 33–41.

[2] E. J. Grinberg, Plane homogeneous graphs of degree three without Hamiltonian circuits, *Latvian Math. Yearbook* **4** (1968) 51–58 (in Russian).

[3] H. Hatzel, Ein planarer hypohamiltonscher Graph mit 57 Knoten, *Math. Ann.* **243** (1979) 213–216 (in German).

[4] D. A. Holton and J. Sheehan, The Petersen Graph, Chapter 7: Hypohamiltonian graphs, Cambridge University Press, New York (1993).

[5] C. Thomassen, Planar and infinite hypohamiltonian and hypotraceable Graphs, *Discrete Math.* **14** (1976) 377–389.

[6] C. Thomassen, Planar cubic hypohamiltonian and hypotraceable graphs, *J. Combin. Theory, Ser. B* **30** (1981) 36–44.

[7] G. Wiener and M. Araya, On Planar Hypohamiltonian Graphs, *J. Graph Theory* **67** (2011) 55–68.

[8] C. T. Zamfirescu and T. I. Zamfirescu, A Planar Hypohamiltonian Graph with 48 Vertices, *J. Graph Theory* **55** (2007) 338–342.

Geometrische Eigenschaften von Perkolationsclustern auf Cayleygraphen (17:45 Uhr)

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Es werden zunächst geometrische Eigenschaften von Perkolationsclustern auf $\mathbb{Z}^d$-Gittern diskutiert und dann darauf eingegangen, wie sich die Situation ändert, falls man zu allgemeineren Graphen, speziell Cayleygraphen übergeht. Schließlich wird ein Ausblick auf die zugehörigen spektralen Eigenschaften gegeben.

Weiterer Vortrag bzw. Abendessen (18:15 Uhr)