DOCTORAL PROGRAM
DISCRETE MATHEMATICS
TU & KFU GRAZ • MU LEOBEN
AUSTRIA

TU Graz
Graz University of Technology

Doctoral Program Discrete Mathematics

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OPENING OF THE SECOND PHASE

Tuesday, 27 October 2015

TU Graz, Steyrergasse 30,
Lecture Hall BE01 (ground floor)

Graz, 13 October 2015

Schedule and abstracts

$11:00 - 11:20$ **Opening**
Presentation of the Doctoral Program Discrete Mathematics

$11:20 - 12:10$ **Talk by Prof. Emo Welzl (ETH Zurich)**
Crossing-Free Perfect Matchings (et al.) on Wheel Point Sets

A perfect matching on a finite planar point S set is crossing-free if all of its edges are disjoint in the straight-line embedding on S. In 1948 Motzkin counted the number of such crossing-free perfect matchings if S is the vertex set of a convex polygon; this number is the m-th Catalan number for $m = |S|/2$.

S is called a wheel set if all but exactly one point in S are vertices of its convex hull. Again we start by asking for the number of crossing-free perfect matchings of such a wheel set S, going the smallest possible step beyond Motzkin's endeavor. Since position matters now, in the sense that the number is not determined by the cardinality of the wheel set alone, this immediately raises extremal and algorithmic questions. Answering these innocent looking questions comes with all kinds of surprises, and then it takes us on a journey with visits to the rectilinear crossing-number of the complete graph and polytopes with few vertices.

$12:10 - 13:30$ **Lunch and coffee break**

$13:30 - 14:30$ **Talks by two students from the first phase**
Mario Weitzer (DK-Project 06) and Christopher Frei (DK-Project 09) talk about their experience in the Doctoral Program Discrete Mathematics and their current research.

please turn over

$14:30 - 15:20$ **Talk by Prof. Ilse Fischer (University of Vienna)**

The last shingle on the roof: diagonally and antidiagonally symmetric alternating sign matrices of odd order

It is known that there are as many order n alternating sign matrices as there are totally symmetric self-complementary plane partitions in an $2n \times 2n \times 2n$ box and as there are descending plane partitions with parts no greater than n. To construct explicit bijections between these three classes of objects is maybe the most intriguing open problem in the field of plane partition and alternating sign matrix counting. We have recently discovered a fourth class of objects, so-called alternating sign triangles, that are also equinumerous with these objects. This discovery happened in connection with our recent proof of the product formula for the number of diagonally and antidiagonally symmetric alternating sign matrices of odd order. The latter settles a conjecture of David Robbins and Richard Stanley from the 1980s and finally concludes the program of enumerating symmetry classes of alternating sign matrices that allow such product formulas. Most of the talk will be concerned with describing this proof.