DK: Doctoral Program in Discrete Mathematics

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DISCRETE MATHEMATICS DAY 2013

Friday, June 7, 2013, 09:15-16:30
Lecture hall **HS P2**, Petersgasse 16, EG, TU Graz

Graz, Mai 2013

Program

$09^{15} - 09^{30}$ Opening

$09^{30} - 10^{30}$ Endre Szemerédi
(Alfréd Rényi Mathematical Institute & Rutgers University)
Tight bound for embedding large maximum degree tree

$10^{30} - 11^{00}$ **Coffee break**

$11^{00} - 11^{20}$ DK Talk: Mario Weitzer (Uni Leoben)
Shift Radix Systems - some new characterization results and topological properties

$11^{20} - 11^{40}$ DK Talk: Maria Rita Iacò (TU Graz & University of Calabria)
A dynamical system approach to the Kakutani-Fibonacci sequence of points

$11^{40} - 14^{00}$ **Lunch break**

$14^{00} - 14^{20}$ DK Talk: Alina Bazarova (TU Graz)
Extremal theory of dependent processes

$14^{20} - 15^{20}$ Imre Bárány
(Alfréd Rényi Mathematical Institute & University College London)
Extremal problems for convex lattice polytopes

$15^{20} - 15^{50}$ **Coffee break**

$15^{50} - 16^{30}$ Ursula Neugebauer (Berlin University of the Arts)
The Greatest Happiness Imaginable
movie presentation & discussion

For lunch buffet and coffee breaks, it is **required** to register by sending an email to `discrete@tugraz.at`.

Abstracts

- 9:30 - 10:30 **Endre Szemerédi**
(Alfréd Rényi Mathematical Institute, Budapest and Rutgers University, New Jersey)
Title: *Tight bound for embedding large maximum degree tree*

Abstract:
Let $\delta(G)$ denote the minimal degree of G and $\Delta(T)$ denote the maximum degree of a tree T on n vertices. Bollobás conjectured that if $\delta(G) \geq \left(\frac{1}{2} + \epsilon\right) n$ and $\delta(t) \leq C$, then for n large enough, G contains T. We prove a much stronger result. We prove that if

$$\Delta(T) \leq \frac{1}{2} \frac{n}{\log n} \quad \text{and} \quad \delta(G) > \frac{n}{2} + 2\Delta(T) \log n,$$

then

$$T \subset G, \quad |V(G)| = |V(T)| = n.$$

- 11:00 - 11:20 **Mario Weitzer**
(Uni Leoben)
Title: *Shift Radix Systems - some new characterization results and topological properties*

Abstract:
Shift Radix Systems (SRS) turned out to be the missing link between two generalizations of positional notation systems - Beta-Expansions and Canonical Number Systems (CNS) - which have been studied extensively during the last decade, but still leave behind many open questions and unsolved problems. In distinction from positional notation systems, where all integers greater than 1 can serve as a basis, in the general cases only the elements of complicated sets satisfy certain natural finiteness conditions. An introduction to SRS is given and results in relation to the characterization of such sets are being presented. These results settle two previously open topological questions. For a specific set it is shown that it is disconnected and so is its complement.

- 11:20 - 11:40 **Maria Rita Iacò**
(TU Graz & University of Calabria)
Title: *A dynamical system approach to the Kakutani-Fibonacci sequence of points*

Abstract:
The Kakutani-Fibonacci sequence has been introduced by Carbone [1] as the sequence of points associated to a sequence of partitions. The sequence of partitions is obtained by splitting the unit interval into two parts of lenght α and α^2, respectively, where α is the root of the quadratic equation $x^2 + x - 1 = 0$. It has been proved that the associated sequence of points is uniformly distributed mod 1. In this talk I would like to show how to get this sequence as the orbit of the origin of an ergodic transformation. This transformation has been called von Neumann-Kakutani transformation in [2] and in [3] it has been showed that it is in fact a uniquely ergodic transformation. This last property allows us to construct infinitely many uniformly distributed sequences mod 1.

[1] I. Carbone, Discrepancy of LS-sequences of partitions and points. *Ann. Mat. Pura Appl.*, **191** (2012), 819-844.

[2] I. Carbone, M.R. Iacó, A. Volcic, A dynamical system approach to the Kakutani-Fibonacci sequence. *to appear in Ergodic Theory and Dynamical Systems*

[3] M. Hofer, M.R. Iacó, R. Tichy, Ergodic properties of Îš-adic Halton sequences, submitted (2013)

- 14:00 - 14:20 **Alina Bazarova**
(TU Graz)
Title: *Extremal theory of dependent processes*

Abstract:
Trimming is a standard method of statistics to decrease the effect of large sample elements in various procedures of statistical inference. However, removing extreme elements from function series is also a powerful tool in analysis and probability theory. In this talk, we use this method to prove new results in the metric theory of continued fractions, the theory of games and the theory of stochastic processes.

- 14:20 - 15:20 **Imre Bárány**
  (Alfréd Rényi Mathematical Institute, Budapest and University College London)
  Title: *Extremal problems for convex lattice polytopes*

  Abstract:
  In this survey I will present several extremal problems, and some solutions, concerning convex lattice polytopes. A typical example is to determine the minimal volume that a convex lattice polytope can have if it has exactly n vertices. Other examples are the minimal surface area, or the minimal lattice width in the same class of polytopes. These problems are related to a question of V. I. Arnold from 1980 asking for the number of (equivalence classes of) lattice polytopes of volume V in d-dimensional space, where two convex lattice polytopes are equivalent if one can be carried to the other by a lattice preserving affine transformation.

- 15:50 - 16:30 **Ursula Neugebauer**
  (Berlin University of Arts)
  Title: *The Greatest Happiness Imaginable*

  Abstract:
  I dedicated the video "The Greatest Happiness Imaginable" to the mathematician Grigori Perelman, who succeeded in proving the century-old Poincaré conjecture, simply publishing his solution on the Internet for everyone to see. Perelman declined all prizes subsequently awarded to him, for example the Fields Medal and the prize money associated with the Clay Mathematics Institute. Perelman leads a withdrawn life with his mother in a tower block in St. Petersburg and refuses to give interviews.

  Impressed by his lack on interest in power and money, I wrote Grigori Perelman a letter that has so far gone unanswered. The video consists of two letters. One which I wrote and sent to Perelman and one in which I reply in his stead. A dialogue which I think might have taken place. The text accompanies the scant paparazzi film footage that exists of Perelman. I see the scientist – interested only in the matter at hand, but not in worldly fame – as an artist and kindred spirit sharing in a space as a place of beauty.