BRÅKET

Information om seminarier och högre undervisning i matematiska ämnen i Stockholmsområdet

NR 28 **FREDAGEN DEN 11 SEPTEMBER 2009**

BRÅKET

Veckobladet från Institutionen för matematik vid Kungl Tekniska Högskolan och Matematiska institutionen vid Stockholms universitet

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Sista manustid för nästa nummer:
Torsdagen den 17 september kl. 13.00.

The Rolf Sundberg Symposium

Detta skall äga rum vid SU onsdagen den 16 september. Se Bråket nr 27 sidan 7.

Colloquium in honour of Allan Gut on the occasion of his 65th birthday

Detta skall äga rum i Uppsala fredagen den 18 september. Se Bråket nr 27 sidan 8.

SEMINARIER

Fr 09–11 kl. 15.15 – 16.15. Matematiska kollokviet i Uppsala. Boris Shapiro, SU: *Mystery of point charges.* Häggsalen, Ångströmlaboratoriet, Uppsala universitet. Kaffe/te serveras utanför föreläsningssalen kl. 14.55. Se Bråket nr 27 sidan 6.

Må 09–14 kl. 13.15. Licentiatseminarium i matematik. Helena Granström presenterar sin licentiatavhandling: *Simplices, frames and questions about reality.* Presentationen ges på svenska. Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 4.

Fortsättning på nästa sida.

Disputation i numerisk analys

Måns Elenius skall disputera vid SU på avhandlingen *Computer Simulations of Simple Liquids with Tetrahedral Local Order: the Supercooled Liquid, Solids and Phase Transitions* fredagen den 11 september kl. 10.15 i Sydvästra galleriet, KTHB, Osquars Backe 31. Se Bråket nr 26 sidorna 5 – 6.

Disputation i teoretisk fysik

Narit Pidokrajt skall disputera vid SU på avhandlingen *Information geometries in black hole physics* måndagen den 21 september kl. 13.00. Se sidan 9.

Mini-Conference on Digital Geometry

Denna skall äga rum vid Uppsala universitet torsdagen den 24 september. Se sidorna 10 – 11.

Kurser

Pär Kurlberg: Reading course on computational number theory. Se sidan 4.

Krister Svanberg: Convexity and optimization in linear spaces. Se sidan 7.

Seminarier (fortsättning)

Må 09–14 kl. 15.15 – 16.00. Seminarium i finansiell matematik. Jesper Frick presenterar sitt examensarbete: *Modelling credit risk with macroeconomic factors.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.

Må 09–14 kl. 16.15 – 17.00. Seminarium i finansiell matematik. Ieva Gediminaité presenterar sitt examensarbete: *On the Prediction Error in Several Claims Reserves Estimation Methods.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.

On 09–16 kl. 10.15 – 11.15. Kombinatorikseminarium — docentföreläsning i matematik. Axel Hultman, KTH: *Singularities of Schubert varieties and their relatives.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 27 sidan 7.

On 09–16 kl. 11.00 – 12.00. KTH/Nordita/SU Seminar in Theoretical Physics. Joakim Arnlind: *Geometry and topology in the matrix regularization of membrane theory.* Sal FA31, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se sidan 4.

On 09–16 kl. 13.00 – 14.30. Öppen föreläsning anordnad av Institutionen för matematikämnets och naturvetenskapsämnenas didaktik vid SU. Kerstin Pettersson, Högskolan i Skövde: *Algoritmiska, intuitiva och formella aspekter av matematiken i dynamiskt samspel.* Amelinsalen, A508, Campus Konradsberg.

On 09–16 kl. 13.15 – 14.00. Algebra and Geometry Seminar. Wojciech Chachólski, KTH: *Property of groups.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 7.

On 09–16 kl. 13.15 – 14.15. Seminarium i analys och dynamiska system. Igor Wigman, KTH: *Nodal lines of random Laplace eigenfunctions.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 8.

On 09–16 kl. 14.00 – 15.00. Institut Mittag-Leffler Seminar. Saharon Shelah, Hebrew University and Rutgers University: *An advance on the existence of completely separable MAD families.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 8.

On 09–16 kl. 14.30 – 15.30. KCSE (KTH Computational Science and Engineering Centre) Seminar. Andreas Vallgren, Institutionen för mekanik, KTH: *High resolution simulations of 2D and 3D quasigeostrophic turbulence.* PDC:s seminarierum, KTH, Teknikringen 14, plan 3. Se Bråket nr 27 sidan 8.

On 09–16 kl. 15.30 – 16.30. Institut Mittag-Leffler Seminar. Ali Enayat, American University, Washington DC: *Automorphisms of models of set theory.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 8.

To 09–17 kl. 10.30. Seminar in Fluid Mechanics. Toshiyuki Oyama, University of Tokyo: *Surface tension effect on a single bubble bouncing on a free surface with a front-tracking method.* Seminarierummet, Institutionen för mekanik, KTH, Teknikringen 8. Se sidan 5.

To 09–17 kl. 14.00 – 15.00. Institut Mittag-Leffler Seminar. Paul Larson, Miami University, Ohio: *Universally measurable sets in generic extensions.* Institut Mittag-Leffler, Auravägen 17, Djursholm.

Fortsättning på nästa sida.

Seminarier (fortsättning)

To 09–17 kl. 15.00 – 17.00. AlbaNova and Nordita Colloquium in Physics. *(Observera tiden!)* **Thomas Schlathölter,** University of Groningen: *Molecular mechanism underlying heavy ion therapy.* Oskar Kleins auditorium, Roslagstullsbacken 21, AlbaNova universitetscentrum. Se Bråket nr 27 sidan 10.

To 09–17 kl. 15.30 – 16.30. Institut Mittag-Leffler Seminar. Justin Moore, Cornell University, Ithaca: *CH and the combinatorics of the club filter.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 12.

Fr 09–18 kl. 13.15 – 14.15. Graduate Student Seminar. Alan Sola: *Potential theory & Julia sets.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 12.

Må 09–21 kl. 13.30 – 14.30. Optimization and Systems Theory Seminar. *(Observera dagen och tiden!)* **Professor Virginia Torczon,** College of William & Mary, Williamsburg, Virginia, USA: *Active set identification for linearly constrained minimization without explicit derivatives.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.

Ti 09–22 kl. 16.30 – 18.00. Offentlig föreläsning på Kungl. Vetenskapsakademien. Siv Andersson, Uppsala universitet: *De svenska genomprojekten på bakterier: Vad vi inte ens kunnat drömma om.* **Magnus Berggren,** Linköpings universitet: *Organisk bioelektronik.* **Johan Håstad,** KTH: *Om konsten att hitta hyggligt bra lösningar till svåra beräkningsproblem fort.* Linnésalen, Kungl. Vetenskapsakademien, Lilla Frescativägen 4A, Stockholm.

De tre föreläsarna har alla tidigare fått Göran Gustafssonpriset för sin forskning. Föreläsningen arrangeras av Göran Gustafssons Stiftelse.

On 09–23 kl. 10.15. Kombinatorikseminarium. Piotr Przytycki, Warszawa: *Acute triangulations of polyhedra.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 10.

On 09–23 kl. 13.15. Algebra and Geometry Seminar. Alistair Craw, Glasgow: *Quiver flag varieties.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

On 09–23 kl. 16.00. KTH/SU Mathematics Colloquium. Saharon Shelah, Hebrew University and Rutgers University: *Title to be announced.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Kaffe/te serveras kl. 15.30 i pausrummet, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 4.

Fr 09–25 kl. 15.15 – 16.30. Seminarium i matematisk statistik. *(Observera dagen och tiden!)* **Professor Thomas Kaijser,** Matematiska institutionen, Linköpings universitet: *On partially observed Markov chains.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 9.

LICENTIATSEMINARIUM I MATEMATIK

Helena Granström

presenterar sin licentiatavhandling:

Simplices, frames and questions about reality

Sammanfattning: Avhandlingens nav är ett antal matematiska strukturer med relevans för kvantinformation och kvantmekanikens grunder. Den första av de två inkluderade artiklarna behandlar frågan om kontextualitet. Utifrån en specifik regel för att tilldela definitiva värden till vektorer i tillståndsrummet utforskas några aspekter av Kochen och Speckers teorem. I den andra artikeln studeras uppförandet hos en måttfunktion för hur nära en given uppsättning vektorer är att utgöra en SIC-POVM, en konfiguration av betydelse för experimentell så väl som teoretisk kvantmekanik.

Sökandet efter kopplingar mellan SIC-POVM:er och så kallade MUB:ar berörs också, liksom en grafstruktur med koppling till Kochen och Speckers resultat.

Tid och plats: Måndagen den 14 september kl. 13.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Presentationen ges på svenska.

KTH/NORDITA/SU SEMINAR IN THEORETICAL PHYSICS

Joakim Arnlind:
Geometry and topology
in the matrix regularization of membrane theory

Abstract: Just as string theory is based on the principle that a moving string should sweep out a minimal area in space-time, membrane theory demands that a membrane (i.e. a surface) should sweep out a minimal volume. In string theory, one has by now access to a large amount of information about the classical and quantum system. In comparison, almost nothing is known for membranes; even the classical equations of motion are not easy to handle. So far, the only path to the corresponding quantum system has gone through a "matrix regularization". More specifically, functions are replaced by sequences of matrices (of increasing dimension) in such a way that the physically important Poisson bracket corresponds to commutators of matrices. It turns out that this procedure is not only directly relevant for physics, but is also of separate interest from a purely mathematical point of view. In this talk I will give a short introduction to this way of regularizing by matrices, and then present some recent results on how geometry can be encoded in matrix sequences.

Tid och plats: Onsdagen den 16 september kl. 11.00 – 12.00 i sal FA31, Roslagstullsbacken 21, AlbaNova universitetscentrum.

GRADUATE COURSE IN MATHEMATICS

Reading course on computational number theory

Course leader: **Pär Kurlberg.**

The weekly meetings will be held on Tuesdays at 15.15 – 17.15 in seminar room 3721, Department of Mathematics, KTH, Lindstedtsvägen 25, floor 7.

For more details about the course, see Bråket no. 26 page 4 and the homepage http://www.math.kth.se/~kurlberg/compnt09/.

SEMINARIUM I FINANSIELL MATEMATIK

Jesper Frick

presenterar sitt examensarbete:

Modelling credit risk with macroeconomic factors

Abstract: A model of loan losses for Swedbank has been developed. Loan losses of nine different segments and the two major regions in which Swedbank is active, Sweden and the Baltic region, are mapped to changes in macroeconomic factors of the two regions. The time lags of with which macroeconomic factors explain loan losses are studied. Linear regression is performed of loss ratios on changes of macroeconomic factors at the optimal time lags. A model for the changes of macroeconomic factors is calibrated and a large number of simulations are performed. Using the simulated samples, Swedbank's future loss ratios are predicted one quarter and one year ahead.

Changes of macroeconomic factors in the Baltic region are shown to explain the loan losses of the Baltic region well. The changes of macroeconomic factors of the Swedish region are shown to have a low level of explanation of loss ratios pertaining to the Swedish region. The fact that loss ratios in the Baltic region are better explained by macroeconomic factors could be explained by customers in this region having less buffer to adverse movements of the economy.

Tid och plats: Måndagen den 14 september kl. 15.15 – 16.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINAR IN FLUID MECHANICS

Toshiyuki Oyama:
Surface tension effect on a single bubble bouncing on a free surface with a front-tracking method

Abstract: I will present a numerical study of a bubble-bouncing with a free surface using a three-dimensional front-tracking method. According to our preliminary study, the bubble-free surface interaction is summarized as follows. The bubble becomes slightly oblate as it propels upward, and the bubble starts contacting at the side, rather than the top, to the elevated free surface. Then the liquid in film between the bubble and free surface is gradually drained until the bubble reaches the highest position. Finally, the bubble bounces back from the free surface due to the stored energy on both of the surfaces and the self-induced flow field. We focus in the rebound depth and the duration time of bubble-free surface contact (contact time, hereafter). The contact time measured from the distance between the bubble centre and free surface exhibits -0.5 power of surface tension coefficient, whereas the contact time based on the distance between the bubble top and free surface was found to be insensitive to the surface tension coefficient. The rebound depth is much smaller than the experimental value, and the obtained depth is similar to the rebound depth of a bubble which contacts a wall. This result implies that the front-tracking method does not satisfy the free-slip condition near the interfaces when two interfaces are close.

Tid och plats: Torsdagen den 17 september kl. 10.30 i seminarierummet, Institutionen för mekanik, KTH, Teknikringen 8.

SEMINARIUM I FINANSIELL MATEMATIK

Ieva Gediminaité

presenterar sitt examensarbete:

On the Prediction Error in Several Claims Reserves Estimation Methods

Abstract: The Chain-Ladder (CL) and the Bornhuetter-Ferguson (BF) reserve estimation methods are the most common in the general insurance reserving process. It is very important to know how accurate the resulting estimates are. Mack derived theoretical prediction error formulae for the CL method in 1993 and for the BF method in 2008. Also, bootstrap technique for the CL method has been introduced and developed since England & Verall published their work in 1999.

In this thesis the theory behind all the calculations is first explained. Then, the personal accident (PA) insurance data from Trygg-Hansa Försäkrings AB are analysed. First, the theoretical prediction error for both methods is calculated, according to the articles by Mack. Second, the most recently developed bootstrap procedure is applied for the CL method.

Finally, a bootstrap procedure to calculate the estimation error of the BF method is constructed and applied on the PA data. A comparison study of all the performed computations is then given.

Tid och plats: Måndagen den 14 september kl. 16.15 – 17.00 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

OPTIMIZATION AND SYSTEMS THEORY SEMINAR

Virginia Torczon:
Active set identification for linearly constrained minimization without explicit derivatives

Abstract: We consider active set identification for linearly constrained optimization problems in the absence of explicit information about the derivative of the objective function. We begin by presenting some general results on active set identification that are not tied to any particular algorithm. These general results are sufficiently strong that, given a sequence of iterates converging to a Karush-Kuhn-Tucker point, it is possible to identify binding constraints for which there are nonzero multipliers. We then focus on generating set search methods, a class of derivative-free direct search methods. We discuss why these general results, which are posed in terms of the direction of steepest descent, apply to generating set search, even though these methods do not have explicit recourse to derivatives. Nevertheless, there is a clearly identifiable subsequence of iterations at which we can reliably estimate the set of constraints that are binding at a solution. We discuss how active set estimation can be used to accelerate generating set search methods and illustrate the appreciable improvement that can result using several examples from the CUTEr test suite. We also introduce two algorithmic refinements for generating set search methods.

The first expands the subsequence of iterations at which we can make inferences about stationarity. The second is a more flexible step acceptance criterion.

This is joint work with Robert Michael Lewis.

Tid och plats: Måndagen den 21 september kl. 13.30 – 14.30 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

ALGEBRA AND GEOMETRY SEMINAR

Wojciech Chachólski: Property of groups

Abstract: A property of groups is simply a collection C of groups closed under isomorphisms. A group can have such a property (it belongs to C) or not. We are however interested in understanding more. We would like to be able to measure how close a given group is from satisfying a given property. We would like to estimate the failure of a group to satisfy a property. How can this be done? We are going to use the notion of a C-cover of a group G. This is a homomorphism from a group X to G such that X satisfies C and this homomorphism is terminal with this respect. The aim of the talk is to classify the collection $\mathrm{Cov}(G)$ of all possible covers of a group G. I will show that such a classification is possible for a finite group G.

I will also present an explicit classification in the case G is finite and simple. In this case the covers can be enumerated by subsets of primes dividing the second integral homology of G, the so-called Shur multiplier of G.

This is a joint work with E. Damian, E. Dror Farjoun, and Y. Segev.

Tid och plats: Onsdagen den 16 september kl. 13.15 – 14.00 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

GRADUATE COURSE IN OPTIMIZATION AND SYSTEMS THEORY

Convexity and optimization in linear spaces (SF3810, 7.5 hp)

This course is compulsory for graduate students in optimization and systems theory, but other graduate students interested in optimization theory are also most welcome.

Lecturer and examiner: **Krister Svanberg,** e-mail: krille@math.kth.se, telephone: 08-790 71 37.

Content: Basic theory for normed linear spaces. Minimum norm problems in Hilbert and Banach spaces. Convex sets and separating hyperplanes. Adjoints and pseudoinverse operators. Gateaux and Frechet differentials. Convex functionals and their corresponding conjugate functionals. Fenchel duality. Global theory of constrained convex optimization. Lagrange multipliers and dual problems. Local theory of constrained optimization. Kuhn-Tucker optimality conditions in Banach spaces.

Prerequisites: Mathematics corresponding approximately to a Master of science in engineering physics, including a basic course in optimization.

Literature: David G. Luenberger: *Optimization by vector space methods*, John Wiley & Sons. Paperback, ISBN: 0-471-18117-X.

Examination: Examination through home assignments during the course, and a final oral examination.

Time and place for lectures: Tuesdays at 13.15 – 15.00 (to begin with). There will be around 14 lectures. First lecture: September 15, 2009, in room D32, KTH, Lindstedtsvägen 17, ground floor. Second lecture: September 22, 2009, in room D31, KTH, Lindstedtsvägen 17, ground floor.

Welcome!
Krister Svanberg

SEMINARIUM I ANALYS OCH DYNAMISKA SYSTEM

Igor Wigman:
Nodal lines of random Laplace eigenfunctions

Abstract: We are interested in the length of nodal lines for eigenfunctions of the Laplacian corresponding to large eigenvalues. In case of the torus or the sphere, the eigenspaces are degenerate, so that we may endow the eigenspaces with Gaussian probability measure. We study the distribution of the length of nodal lines of random eigenfunction in the corresponding ensemble.

First, using a standard technique, we compute an exact expression for the expected value of the length. Our main result concerns the variance.

This work is joint with Zeev Rudnick and Manjunath Krishnapur. Time permitting, I will also show a recent related result joint with John Toth concerning the number of open nodal lines on a generic billiard.

Tid och plats: Onsdagen den 16 september kl. 13.15 – 14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

INSTITUT MITTAG-LEFFLER SEMINAR

Saharon Shelah:
An advance on the existence of completely separable MAD families

Abstract: We throw some light on the question: Is there a MAD family (= a maximal family of infinite subsets of $\mathbb{N}$, the intersection of any two is finite), which is completely separable (i.e. any $X \subseteq \mathbb{N}$ is included in a finite union of members of the family or includes a member (and even continuum many members) of the family). We prove that it is hard to prove the consistency of the negation:

(a) If $2^{\aleph_0} < \aleph_\omega$, then there is such a family.

(b) If there is no such families then some situation related to pcf holds whose consistency is large; and if $\mathfrak{a} > \aleph_1$ even unknown.

(c) If there is no inner model with measurables then there is such a family.

Tid och plats: Onsdagen den 16 september kl. 14.00 – 15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

INSTITUT MITTAG-LEFFLER SEMINAR

Ali Enayat:
Automorphisms of models of set theory

Abstract: I will provide a survey of various results (some old, but mostly new) on automorphisms of models of set theory, with an eye towards

(a) comparisons/contrasts of the behaviour of automorphisms of models of PA and models of ZFC; and

(b) applications to the Quine-Jensen system NFU of set theory with a universal class.

Tid och plats: Onsdagen den 16 september kl. 15.30 – 16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

DISPUTATION I TEORETISK FYSIK

Narit Pidokrajt

skall disputera vid SU på avhandlingen

Information geometries in black hole physics

måndagen den 21 september 2009 kl. 13.00 i sal FD41, Roslagstullsbacken 21, AlbaNova universitetscentrum. Till opponent har utsetts *Associate Professor Jorma Louko,* School of Mathematical Sciences, University of Nottingham.

Abstract of the thesis

In this thesis we aim to develop new perspectives on the statistical mechanics of black holes using an information geometric approach (Ruppeiner and Weinhold geometry). The Ruppeiner metric is defined as a Hessian matrix on a Gibbs surface, and provides a geometric description of thermodynamic systems in equilibrium. This Ruppeiner geometry exhibits physically suggestive features; a flat Ruppeiner metric for systems with no interactions i.e. the ideal gas, and curvature singularities signalling critical behaviour(s) of the system. We construct a flatness theorem based on the scaling property of the black holes, which proves to be useful in many cases. Another thermodynamic geometry known as the Weinhold geometry is defined as the Hessian of internal energy and is conformally related to the Ruppeiner metric with the system's temperature as a conformal factor.

We investigate a number of black hole families in various gravity theories. Our findings are briefly summarized as follows: the Reissner-Nordström type, the Einstein-Maxwell-dilaton and BTZ black holes have flat Ruppeiner metrics that can be represented by a unique state space diagram. We conjecture that the state space diagram encodes extremality properties of the black hole solution. The Kerr type black holes have curved Ruppeiner metrics whose curvature singularities are meaningful in five dimensions and higher, signifying the onset of thermodynamic instabilities of the black hole in higher dimensions. All the three-parameter black hole families in our study have non-flat Ruppeiner and Weinhold metrics and their associated curvature singularities occur in the extremal limits. We also study two-dimensional black hole families whose thermodynamic geometries are dependent on parameters that determine the thermodynamics of the black hole in question. The tidal charged black hole which arises in the braneworld gravity is studied. Despite its similarity to the Reissner-Nordström type, its thermodynamic geometries are distinctive.

SEMINARIUM I MATEMATISK STATISTIK

Thomas Kaijser:
On partially observed Markov chains

Abstract: Let $\{X(n)\}$ denote a Markov chain and $\{Y(n)\}$ denote a sequence of "partial" observations of the $\{X(n)\}$ process. Let $Z(n)$ denote the conditional distribution of $X(n)$ given the partial observation $\{Y(m),\ m = 1, 2, \ldots, n\}$. The process $\{Z(n)\}$ is often called the filtering process.

The purpose of this talk is to present a limit theorem for the distribution of $Z(n)$ for the case when the state space of $X(n)$ is denumerable.

Tid och plats: Fredagen den 25 september kl. 15.15 – 16.30 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

KOMBINATORIKSEMINARIUM

Piotr Przytycki:
Acute triangulations of polyhedra

Abstract: This is joint work with E. Kopczynski and I. Pak. We provide acute triangulations of the regular and the standard tetrahedron, which fit together to form an acute triangulation of the 3-cube. We show that for the 4-cube this is not possible. Neither it is for $\mathbb{R}^4$ if we assume that the 4-simplices of the triangulation have conformally bounded geometry.

Tid och plats: Onsdagen den 23 september kl. 10.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

MINI-CONFERENCE ON DIGITAL GEOMETRY

At the initiative of Professor Maciej Klimek, Uppsala University will organize a Mini-Conference on Digital Geometry on Thursday, September 24, 2009. All interested are welcome. The conference will take place at the Ångström Laboratory, Uppsala University. In the morning the lectures will be given in room 80121 (level 0, house 8). In the afternoon the lectures will be given in the Siegbahn Hall (level 0, house 1).

Program

9.30 – 10.25 **Isabelle Debled-Rennesson:** *A study of discrete curves based on arithmetic discrete straight lines.*
Abstract: I present in this talk the use of arithmetic discrete straight lines, defined by Jean-Pierre Reveillès in 1989, to analyse discrete curves. Properties of arithmetic discrete straight lines are presented and a linear and incremental algorithm of recognition is deduced. Then algorithms for the segmentation, the polygonalization and the analysis (length, curvature) of discrete curves are proposed. Extensions of these results to three-dimensional discrete lines are also presented. In the last part of my talk, I will show how to analyse noisy discrete curves by using an adapted recognition algorithm. Examples of applications are also given.

10.25 – 11.20 **Petter Brändén:** *Discrete concavity and zeros of polynomials.*
Abstract: We will discuss strong discrete concavity properties of Taylor coefficients of multivariate polynomials with prescribed non-vanishing properties. We provide examples and applications such as the tropical Grassmannian in tropical geometry, the minimum matching problem in combinatorics, and Horn's problem in matrix theory.

11.20 – 13.15 Lunch break.

13.15 – 14.10 **Damien Jamet:** *Connectivity of discrete planes with irrational normal.*
Abstract: While arithmetical discrete lines and rational arithmetical planes have been deeply studied since their introduction by Jean-Pierre Reveillès in 1991, only partial results on their topology have been exhibited. In the present lecture, after having introduced the basic notions concerning arithmetical discrete planes, I will focus on how to compute the minimal thickness connecting an arithmetical discrete plane with a given normal vector.

14.10 – 14.40 Tea or coffee.

(Continued on the next page.)

14.40 – 15.35 **Rikard Bøgvad:** *Subharmonic functions and zeros of families of polynomials.*
Abstract: I will describe how a characterization of subharmonic functions that are piecewise harmonic — such as the maximum of a finite number of harmonic functions — can help in understanding the asymptotic properties of zeros of families of polynomials in one variable, arising as eigenvalues to ordinary differential equations. This is built on ideas of Hans Rullgård, and joint work with Borcea, Björk and Shapiro.

15.35 – 16.30 **Anders Heyden:** *Pose invariant shape prior segmentation using continuous graph cuts and gradient descent on Lie groups.*
Abstract: In this talk I will propose a novel formulation of the Chan-Vese model for pose invariant shape prior segmentation as a continuous graph cut problem. The model is based on the classic L^2 shape dissimilarity measure and with pose invariance under the full (Lie) group of similarity transforms in the plane. To overcome the common numerical problems associated with step size control for translation, rotation and scaling in the discretization of the pose model, a new gradient descent procedure for the pose estimation is introduced. This procedure is based on the construction of a Riemannian structure on the group of transformations and a derivation of the corresponding pose energy gradient. Numerically this amounts to an adaptive step size selection in the discretization of the gradient descent equations. Together with efficient numerics for TV-minimization we get a fast and reliable implementation of the model. Moreover, the theory introduced is generic and reliable enough for application to more general segmentation and shape models.

Presentations of the speakers

Isabelle Debled-Rennesson (Henri Poincaré University, Nancy, France) received her Ph.D. in Strasbourg in 1995. She has been an Associate Professor at the University of Nancy (IUFM) since 1997, and she is the head of the ADAGIo team of the LORIA. She defended her habilitation thesis in 2007. Her research area is Discrete Geometry.

Petter Brändén (KTH and Stockholm University) received his Ph.D. in Göteborg in 2005. His primary areas of research are algebraic combinatorics and the distribution of zeros of entire functions.

Damien Jamet (Henri Poincaré University, Nancy, France) received his Ph.D. in Montpellier in 2005 under the supervision of Valérie Berthé. He is an Associate Professor at the University of Nancy since 2006 and a member of the ADAGIo team of the LORIA.

Rikard Bøgvad (Stockholm University) received his Ph.D. in 1983. He is presently interested in algebraic geometric aspects of differential equations (well, the zeros of a polynomial in one variable is of course most naturally seen as a reducible algebraic variety of low dimension . . .).

Anders Heyden (Centre for Mathematical Sciences, Lund University) received his Ph.D. at Lund University in 1995. He has been a professor at Malmö University from 2001 to 2009. His research interests are computer vision, digital image analysis and biomathematics.

Welcome!
Christer Kiselman

INSTITUT MITTAG-LEFFLER SEMINAR

Justin Moore:
CH and the combinatorics of the club filter

Abstract: I will discuss open problems and recent work concerning combinatorial properties of the club filter in the context of the Continuum Hypothesis.

Tid och plats: Torsdagen den 17 september kl. 15.30 – 16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

GRADUATE STUDENT SEMINAR

Alan Sola:
Potential theory & Julia sets

Abstract: Complex dynamical systems were studied extensively in the early 20th century by Fatou and Julia, who established many of the basic properties of the so-called Julia sets associated with iterated complex polynomials (or more generally, rational functions). In the 1980s, computer-generated pictures of these intriguing fractal sets became available, and their beauty helped create renewed interest in the field.

The years between seem to have been a period of less research activity. A notable exception is Hans Brolin's doctoral thesis from the 1960s. In his thesis, Brolin considered, among other things, potential theoretic properties of Julia sets and he proved several elegant theorems in this direction.

I will briefly review some basic material concerning potential theory and complex dynamics, and then present some of Brolin's results.

Tid och plats: Fredagen den 18 september kl. 13.15 – 14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.
