BRÅKET

Information om seminarier och högre undervisning i matematiska ämnen i Stockholmsområdet

NR 38 **FREDAGEN DEN 15 NOVEMBER 2002**

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 21 november kl. 13.00.

New Directions in Mathematical Systems Theory and Optimization

Detta symposium äger rum vid KTH den 15 – 16 november. Se Bråket nr 37 sidan 7.

Radioprogram om Sophie Germain

Detta sänds den 17 november kl. 20.03 i P1 i Sveriges Radio. Se Bråket nr 36 sidan 5.

SEMINARIER

Fr 11–15 kl. 10.15. Guest Lecture. Dr. Alan Kay: *Real children, real math, real science, real computing.* Sal K2, KTH, Teknikringen 28, b.v. Se sidan 7.

Fr 11–15 kl. 10.15 – 12.00. Valda problem i geometri. Sergei Merkulov: *Quantum complex and symplectic manifolds?* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 4.

Fr 11–15 kl. 13.15. Doktorandseminarium. David Jacquet: C-*konvexa mängder med* C^2-*rand.* Sal 37, hus 5, Matematiska institutionen, SU, Kräftriket. Se Bråket nr 37 sidan 8.

Fr 11–15 kl. 14.15. Seminarium i teoretisk datalogi. Professor Johan Håstad, Nada, KTH: *PRIMES is in P.* Sal E2, KTH, Lindstedtsvägen 3, b.v. Se Bråket nr 37 sidan 10.

Må 11–18 kl. 13.15 – 14.15. Seminar in Analysis and its Applications. Leonardo Colzani, Milano: *Slices of convex bodies and lattice points.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 37 sidan 8.

Må 11–18 kl. 13.15 – 15.00. Algebraseminarium. Professor Paul Fuhrmann, Ben-Gurion University of the Negev, Israel: *On the interaction of algebra and control theory.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se Bråket nr 37 sidan 11.

Må 11–18 kl. 15.15. Licentiatseminarium i matematisk statistik. Vid seminariet diskuteras **Fredrik Armerins** avhandling för tekn.-lic.-examen: *On Cash Flow Valuation.* Inbjuden diskutant: **Professor Ingemar Kaj,** Uppsala universitet. Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se Bråket nr 36 sidan 7.

Fortsättning på nästa sida.

Seminarier (fortsättning)

Ti 11–19 kl. 10.15. Plurikomplexa seminariet. Joël Merker, Marseille: *On the local removability of codimension one singularities in generic submanifolds of CR dimension one.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 4.

Ti 11–19 kl. 13.15. Plurikomplexa seminariet. Mikael Passare, SU: *Algebraic equations and hypergeometric functions.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 4.

Ti 11–19 kl. 13.15. Seminar in Theoretical and Applied Mechanics. Professor Martin Lesser, Mekanik, KTH: *Sophia-Mathematica, a new implementation of Sophia in the Mathematica Computer Algebra System.* Seminarierummet, rum S40, Institutionen för mekanik, KTH, Teknikringen 8, b.v. Se Bråket nr 37 sidan 9.

Ti 11–19 kl. 14.00 – 15.00. Mittag-Leffler Seminar. W. D. Evans, Cardiff: *Zero modes of Pauli and Weyl-Dirac operators.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 5.

Ti 11–19 kl. 15.30 – 16.30. Mittag-Leffler Seminar. Christer Bennewitz, Lund: *Inverse spectral theory for left-definite Sturm-Liouville equations.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 6.

On 11–20 kl. 13.15. Logikseminariet Stockholm-Uppsala. *(Observera tiden och lokalen!)* **Jonas Eliasson:** *Ultrasheaves and double negation (continued).* Sal 2245, Matematiska institutionen, Polacksbacken, Uppsala universitet. Se Bråket nr 36 sidan 4.

On 11–20 kl. 13.15 – 14.15. Seminarium i analys och dynamiska system. Jacek Graczyk, Université Paris-Sud, Orsay: *Asymptotic porosity of planar harmonic measure.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.

On 11–20 kl. 14.00 – 15.00. Presentation av examensarbete i matematik. Jonathan Lundborg: *Spektralordning och geometrin av nollställen till komplexa polynom.* Sal 21, hus 5, Matematiska institutionen, SU, Kräftriket. Se sidan 9.

On 11–20 kl. 15.15 – 16.00. Seminarium i matematik och fysik vid Mälardalens högskola (Västerås). Harald Lang, Institutionen för matematik, KTH: *Principer för prissättning av finansiella kontrakt.* Lektionssal T2-056, Mälardalens högskola, Västerås. Se Bråket nr 37 sidan 9.

On 11–20 kl. 15.15. Presentation av examensarbete i matematisk statistik. Steven Wahlström: *En simulering och utvärdering av tre optionsstrategier.* Rum 306, Cramérrummet, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 7.

To 11–21 kl. 14.00 – 15.00. Mittag-Leffler Seminar. Rafael Benguria, Santiago: *The connection between the Lieb-Thirring conjecture for exponent one and a problem in geometry for closed curves in the plane.* Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 6.

To 11–21 kl. 15.30 – 16.30. Mittag-Leffler Seminar. Bernard Helffer, Orsay: *Spectral approach to the Poincaré inequality for Dirichlet forms in* $\mathbf{R}^d$, $d \geq 2$. Institut Mittag-Leffler, Auravägen 17, Djursholm. Se sidan 8.

Fortsättning på nästa sida.

Seminarier (fortsättning)

To 11–21 kl. 16.15 – 18.00. Seminarium i matematik och fysik vid Mälardalens högskola (Eskilstuna). Professor Göran Grimvall, Fysiska institutionen, KTH: *Låter troligt men är fel — Om fenomen i vardagen och problem från prov i skolan, där en enkel fysikalisk-teknisk förklaring kan verka övertygande, men ändå inte är korrekt.* Lektionssal A309, Mälardalens högskola, Eskilstuna.

Fr 11–22 kl. 11.00 – 12.00. Optimization and Systems Theory Seminar. Maurice Heemels, Eindhoven University of Technology: *Complementarity systems and other hybrid model classes — Well-posedness issues.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 10.

Må 11–25 kl. 13.15 – 14.15. Seminar in Analysis and its Applications. Alexander Vasiliev, Technical University Federico Santa Maria, Valparaiso, Chile: *Flows on homogeneous spaces and quasiconformal extensions of free boundaries.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 8.

Må 11–25 kl. 13.15 – 15.00. Algebraseminarium. James Haglund, University of Pennsylvania: *The q,t-Catalan numbers and the space of diagonal harmonics.* Rum 306, hus 6, Matematiska institutionen, SU, Kräftriket. Se sidan 9.

Må 11–25 kl. 15.15 – 16.00. Jubileumsseminarieserie på Nada hösten 2002: Återblickar och framtidsblickar. Gustav Taxén: *Några strandhugg i datorspelens historia.* Sal E2, KTH, Lindstedtsvägen 3, b.v. Se sidan 9.

Må 11–25 kl. 16.15 – 17.00. Seminarium i finansiell matematik. *(Observera tiden!)* **Andreas Johansson** presenterar sitt examensarbete: *Using Extreme Value Theory to Estimate Tails of Operational Loss Distributions.* Seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 8.

On 11–27 kl. 13.15 – 14.15. Seminarium i analys och dynamiska system. Stefano Marmi, Scuola Normale Superiore, Pisa: *Quasianalytic monogenic solutions of cohomological equations.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 6.

On 11–27 kl. 14.30 – 15.30. Seminarium i analys och dynamiska system. Jairo Bochi, IMPA, Rio de Janeiro: *The Lyapunov exponents of C^1-generic volume preserving or symplectic maps.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7. Se sidan 5.

Fr 11–29 kl. 11.00 – 12.00. Optimization and Systems Theory Seminar. Oleg Kirillov, Moscow State Lomonosov University: *Title to be announced.* Seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

VALDA PROBLEM I GEOMETRI

Sergei Merkulov:
Quantum complex and symplectic manifolds?

Abstract: This is the fourth lecture in this series. We shall discuss three topics:
1) Framed little discs operad and dGBV algebras.
2) Vanishing obstructions to extended deformations of Lefschetz symplectic structures.
3) Smoothness of the deformation functor on differential graded Artin rings.

Tid och plats: Fredagen den 15 november kl. 10.15 – 12.00 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

PLURIKOMPLEXA SEMINARIET

Joël Merker:
On the local removability of codimension one singularities in generic submanifolds of CR dimension one

Abstract: Let M be a globally minimal $\mathcal{C}^{2,\alpha}$-smooth generic submanifold of positive codimension in $\mathbb{C}^n$. Following Burglind Jöricke, we consider a compact subset K of a maximally real one-codimensional submanifold M_1 of M and we ask whether continuous CR functions on $M \setminus K$ always extend holomorphically to a wedge attached to M; also, we ask whether L^{p}-integrable functions on M which are CR (in the distribution sense) on $M \setminus K$ are always CR on all of M. The two questions are linked and essentially equivalent.

In 1988 Jöricke discovered, by means of a global Kontinuitätssatz, that the the answer is positive when M is the boundary of the unit ball in $\mathbb{C}^2$. In a recent work (to appear in *Ark. Mat.*), Egmont Porten removed the pseudoconvexity assumption, by filling generic two-spheres with Levi-flat three-spheres, and he established that the answer is positive for an arbitrary globally minimal $\mathcal{C}^\infty$-smooth hypersurface M in $\mathbb{C}^2$. In this talk I will report on a joint work (in progress) with Porten, in which we show that the answer is also positive in $\mathbb{C}^2$ if M_1 is allowed to contain a discrete set of points which are hyperbolic in the sense of Bishop.

The core of the proof consists of a localization argument based on families of analytic discs which are half-attached to M_1 in a neighbourhood of a special, very well-chosen point of K.

Tid och plats: Tisdagen den 19 november kl. 10.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

PLURIKOMPLEXA SEMINARIET

Mikael Passare:
Algebraic equations and hypergeometric functions

Abstract: This is joint work with August Tsikh. We study the solutions of a general n'th order algebraic equation represented by multidimensional hypergeometric series and integrals. We provide a detailed description of the domains of convergence of these series and integrals in terms of the amoeba and the Horn uniformization of the corresponding discriminant. From a geometric viewpoint this amounts to describing all maximal Reinhardt domains and all maximal tube domains in the complement of the discriminant locus.

Tid och plats: Tisdagen den 19 november kl. 13.15 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

MITTAG-LEFFLER SEMINAR

W. D. Evans:
Zero modes of Pauli and Weyl-Dirac operators

Abstract: The existence of zero modes (i.e. eigenfunctions corresponding to an eigenvalue at zero) of Pauli and Weyl-Dirac operators has important mathematical and physical implications. An example of a magnetic potential which yields a zero mode was first given by Loss and Yau in 1986. Since then more examples have been uncovered and many notable contributions to the topic made. In the lecture, a brief formal treatment will initially be given in terms of quaternions which helps to clarify the construction of examples of magnetic potentials which give rise to zero modes. It will then be shown that the magnetic potentials which give rise to zero modes are rare in $[L2(R^n)]^n$, $n = 2, 3$, and an estimate of the number of zero modes will be given.

The lecture will report on joint work with Alex Balinsky.

Tid och plats: Tisdagen den 19 november kl. 14.00 – 15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

SEMINARIUM I ANALYS OCH DYNAMISKA SYSTEM

Jacek Graczyk:
Asymptotic porosity of planar harmonic measure

Abstract: We prove that harmonic measure on every full compact in $\mathbb{C}$ is concentrated on an asymptotically porous set with positive logarithmic density and show that this estimate cannot be generally improved. Namely, there exists a locally connected Julia set of Hausdorff dimension 2 with harmonic measure concentrated on a set which is asymptotically non-porous with positive logarithmic density. Some geometric properties of these exotic Julia sets will also be discussed.

Tid och plats: Onsdagen den 20 november kl. 13.15 – 14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINARIUM I ANALYS OCH DYNAMISKA SYSTEM

Jairo Bochi: The Lyapunov exponents
of C^1-generic volume preserving or symplectic maps

Abstract: Let M be a compact manifold, and let μ be a Riemannian volume measure. We are interested in the Lyapunov exponents of μ-preserving diffeomorphisms of class C^1. If M is two-dimensional, then we prove that there is a residual subset R of the set of all C^1 area-preserving diffeomorphisms such that if $f \in R$ then either f is Anosov or both its Lyapunov exponents are zero μ-almost everywhere.

The more general result (which holds for any dimension) says that for the generic volume preserving diffeomorphism, the Oseledets splitting is dominated at almost every point. (Domination means uniform hyperbolicity in the projective bundle.)

There is also a result for symplectic systems: If M is a compact symplectic manifold, then the C^1-generic symplectic diffeomorphism either is Anosov or has at least two zero Lyapunov exponents at almost every point.

This is a joint work with M. Viana.

Tid och plats: Onsdagen den 27 november kl. 14.30 – 15.30 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

MITTAG-LEFFLER SEMINAR

Christer Bennewitz:
Inverse spectral theory for left-definite Sturm-Liouville equations

Abstract: We consider the equation $-(pu')' + qu = \lambda wu$ on an interval $[0, b)$ where $1/p$ and q are positive and locally integrable, and w is locally integrable but not necessarily of one sign. There is a spectral theory for this equation in a Hilbert space $\mathcal{H}$ with inner product $\langle u, v\rangle = \int_0^b pu'\overline{v'} + qu\overline{v}$. Specifically, introducing appropriate separated boundary conditions there is a selfadjoint operator T and a generalized Fourier transform $\mathcal{F}: \mathcal{H} \to L^2_\rho$ diagonalizing T. Here L^2_ρ is the Hilbert space of square integrable functions with respect to the *spectral measure* $d\rho$.

We shall answer the following question: *To what extent is the operator* T, i.e. *the interval* $[0, b)$, *the coefficients* p, q *and* w, *and the boundary conditions determined by the spectral measure* $d\rho$*?*

This question has some importance in connection with the so-called Camassa-Holm equation for shallow water waves, which is intimately connected with a spectral problem of the type above.

Tid och plats: Tisdagen den 19 november kl. 15.30 – 16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

MITTAG-LEFFLER SEMINAR

Rafael Benguria: The connection
between the Lieb-Thirring conjecture for exponent one
and a problem in geometry for closed curves in the plane

Abstract: In this talk I will present an elementary proof of a theorem of Joseph B. Keller concerning an isoperimetric inequality for the lowest eigenvalue of the one-dimensional Schrödinger operator. Using similar ideas I will show how to relate the Lieb-Thirring conjecture for exponent $\gamma = 1$ with a geometrical variational problem for closed curves in the plane.

Tid och plats: Torsdagen den 21 november kl. 14.00 – 15.00 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

SEMINARIUM I ANALYS OCH DYNAMISKA SYSTEM

Stefano Marmi:
Quasianalytic monogenic solutions of cohomological equations

Abstract: Following a suggestion of Kolmogorov, Arnold and Herman studied the dependence on the multiplier of the solutions of cohomological equations in one complex dimension and in the analytic category (linearization of germs or of circle diffeos). Herman raised the question whether the solutions had a quasianalytic dependence on the multiplier. We show that the answer is affirmative. The dependence on the multiplier is also a nice example of Borel's monogenic function.

This is a joint work with D. Sauzin.

Tid och plats: Onsdagen den 27 november kl. 13.15 – 14.15 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

GUEST LECTURE

Alan Kay:
Real children, real math, real science, real computing

Dr. Alan Kay, who will be awarded honorary doctorship by KTH the same day, will present his work on education with school children under the above-mentioned title.

Dr. Alan Kay is a renowned visionary, and pivotal researcher in modern computer science. He is best known for developing the idea of personal computing and the concept of the intimate laptop computer, the Dynabook, and inventing the now ubiquitous overlapping window interface that has made PC's easier to use. He also invented modern object-oriented programming. As one of the founders of the famed Xerox Palo Alto Research Center in 1970, he led one of the several groups that together developed his ideas and earlier work into modern workstations (forerunners of the MacIntosh), Smalltalk, the overlapping window interface, Desktop Publishing, Ethernet, laser printing, and network "client-servers".

His deep interests in children and education were the catalysts for these ideas, and they continue to be a source of inspiration to him. Prior to his work at Xerox, Dr. Kay was a member of the University of Utah ARPA research team that developed three-dimensional graphics. He also participated in the original design of the ARPANet, which later became the Internet. After 10 years at Xerox PARC, he was Atari's chief scientist for three years. Starting in 1984, Kay was a Fellow at Apple Computer and from 1997 at Walt Disney Imagineering as a Disney Fellow. His current interests continue to centre on creating better learning environments for children and adults, especially to understand better ways to extend, capture, transmit and think about ideas via computer media.

Tid och plats: Fredagen den 15 november kl. 10.15 i sal K2, KTH, Teknikringen 28, b.v..

PRESENTATION AV EXAMENSARBETE I MATEMATISK STATISTIK

Steven Wahlström:
En simulering och utvärdering av tre optionsstrategier

Sammanfattning: Syftet med uppsatsen är att med modern portföljteori klargöra hur tre optionsstrategier utvecklas i jämförelse med varandra och med den underliggande aktiekursen.

Modellen utgår från att vi har en aktie och skall med denna som grund konstruera tre olika optionsportföljer. Dessa skall sedan jämföras med den underliggande tillgången som helt enkelt består i att inneha en aktie. Portföljens utveckling beror på hur man finansierar köpet av optionen. Uppsatsens modell för att beräkna portföljens utveckling har två ofullkomligheter, dels tas ingen hänsyn till kontanta utdelningar på den till optionen underliggande aktien, och dels bortser modellen från transaktionskostnader. Optionernas värde baseras på det teoretiska priset enligt Black-Scholes ekvation, och hela programmet är skrivet i Matlab.

Ett naturligt användningsområde för de presenterade resultaten skulle kunna vara att vid en investering använda optionsstrategin i stället för aktiestrategin med syfte att reducera svängningar i investeringen. Relativt riskvilliga investerare skulle däremot kunna välja en aktiestrategi framför optionsstrategin i aktier som kan anses riskfyllda (hög volatilitet) och därigenom ha chans till en bättre avkastning med priset av en högre riskprofil.

Tid och plats: Onsdagen den 20 november kl. 15.15 i rum 306, Cramérrummet, hus 6, Matematiska institutionen, SU, Kräftriket.

MITTAG-LEFFLER SEMINAR

Bernard Helffer: Spectral approach to the Poincaré inequality for Dirichlet forms in $\mathbf{R}^d$, $d \geq 2$

Abstract: We study the compactness of the resolvent of Witten Laplacians on 0-forms and more generally the validity of the Poincaré inequality for Dirichlet forms in finite dimension. We are interested in the case where some known sufficient condition becomes degenerate. For some classes of polyhomogeneous functions, we get simple conditions which are necessary and sufficient for the Poincaré inequality.

This is a joint work with F. Nier.

Tid och plats: Torsdagen den 21 november kl. 15.30 – 16.30 vid Institut Mittag-Leffler, Auravägen 17, Djursholm.

SEMINAR IN ANALYSIS AND ITS APPLICATIONS

Alexander Vasiliev: Flows on homogeneous spaces and quasiconformal extensions of free boundaries

Abstract: A Jordan closed piecewise smooth curve is a quasidisk if and only if it has no cusp. This very simple idea leads to an investigation of quasiconformal extendability of the free boundary of a Hele-Shaw flow. We obtain a parametric method for quasiconformally extendable conformal maps smooth on the boundary by means of flows on the universal Teichmüller space and Kirillov's manifold. An application to free boundary problems is presented.

Tid och plats: Måndagen den 25 november kl. 13.15 – 14.15 i seminarierum 3733, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.

SEMINARIUM I FINANSIELL MATEMATIK

Andreas Johansson

presenterar sitt examensarbete:

Using Extreme Value Theory to Estimate Tails of Operational Loss Distributions

Abstract: The analysis of operational losses in banks has during the last couple of years become increasingly important. This since banks will be required to hold capital to cover part of the losses. This thesis uses developments within the field of Extreme Value Theory (EVT) to make inference about the tails of operational loss distributions. Especially three issues are focused on; firstly, finding the most appropriate estimator for tails of operational loss distributions, secondly, applying that estimator to an operational loss database, and thirdly, discussing how the results affect the amount of capital banks should hold to cover operational losses.

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

PRESENTATION AV EXAMENSARBETE I MATEMATIK

Jonathan Lundborg: Spektralordning och geometrin av nollställen till komplexa polynom

Abstract: In this thesis we investigate the 1947 conjecture of de Bruijn and Springer about the zeros of an arbitrary complex polynomial and those of its derivative. We review the partial results known so far on this conjecture and discuss some of its consequences for the geometry of zeros of complex polynomials. In particular, by using the theory of majorization of Hardy, Littlewood and Polya, we show that the conjecture would lead to results that lie deeper than the classical Gauss-Lucas Theorem.

Tid och plats: Onsdagen den 20 november kl. 14.00 – 15.00 i sal 21, hus 5, Matematiska institutionen, SU, Kräftriket.

ALGEBRASEMINARIUM

James Haglund: The q,t-Catalan numbers and the space of diagonal harmonics

Abstract: In 1988 Macdonald conjectured that a certain sum of rational functions in two variables q and t simplified to a polynomial in q and t with nonnegative integral coefficients. Research on this conjecture led Garsia and Haiman to pose a related conjecture, that another sum of rational functions they called the q,t-Catalan sequence $C_n(q,t)$, also reduced to a polynomial with nonnegative coefficients. They also proposed an interpretation for the coefficients in terms of the representation theory of the space of "diagonal harmonics". Two years ago Haiman proved Macdonald's conjecture using algebraic geometry and commutative algebra. Shortly after this Garsia and the speaker proved that $C_n(q,t)$ has an elegant combinatorial description which implies nonnegativity, a description which had been conjectured by the speaker based on empirical discoveries. Their proof utilized complicated symmetric function identities developed by Garsia and various collaborators. Also, Haiman extended his geometric methods to prove the representation-theoretic interpretation for $C_n(q,t)$, and in addition proved that the dimension of the space of diagonal harmonics is $(n+1)^{n-1}$. In this talk we overview these results and discuss some recent results and conjectures involving combinatorial descriptions for the Hilbert series of the space of diagonal harmonics and related objects.

Tid och plats: Måndagen den 25 november kl. 13.15 – 15.00 i rum 306, hus 6, Matematiska institutionen, SU, Kräftriket.

JUBILEUMSSEMINARIESERIE PÅ NADA HÖSTEN 2002: ÅTERBLICKAR OCH FRAMTIDSBLICKAR

Gustav Taxén: Några strandhugg i datorspelens historia

Sammanfattning: När William A. Higinbotham år 1958 satte ihop sitt spel *Tennis for two* med hjälp av analoga datorkretsar hade han ingen aning om att han skulle lägga grunden för en underhållningsindustri som idag omsätter mer än Hollywoods filmproduktioner. Den här föreläsningen kommer att berätta historien kring några av de tidiga datorspelspionjärerna och deras skapelser.

Tid och plats: Måndagen den 25 november kl. 15.15 – 16.00 i sal E2, KTH, Lindstedtsvägen 3, b.v.

OPTIMIZATION AND SYSTEMS THEORY SEMINAR

Maurice Heemels: Complementarity systems and other hybrid model classes — Well-posedness issues

Abstract: Technological innovation pushes towards the consideration of dynamical systems of a mixed continuous and discrete nature, which are called hybrid systems. Hybrid systems arise, for instance, from the combination of an analogue continuous-time process and a digital time-asynchronous controller. Also many physical systems display hybrid behaviour: The description of multi-body dynamics depends crucially on the presence or absence of a contact, models of friction phenomena distinguish between slip and stick phases, and electrical circuits contain switching elements like diodes that can be blocking (open circuit) or conducting (short circuit).

Several hybrid modelling frameworks have been introduced recently ranging from the general hybrid automaton model to more dedicated descriptions like piecewise affine systems. In this presentation we consider a hybrid model class consisting of so-called linear complementarity systems, which are close to piecewise affine systems. Complementarity systems show up naturally in the physical multi-modal systems mentioned before, but also in situations where piecewise linear elements like saturations, dead zones or relays play a role or in sets of equations resulting from optimal control problems with state or control constraints like in closed-loop MPC systems.

The presentation starts by showing how the models use the complementarity to capture the non-smoothness in the applications. Complementarity is defined between pairs of variables and is given by nonnegativity conditions and a complementary zero structure of the variables like in the voltage/current-relation of an ideal diode and the constraint/Lagrange multiplier-description in optimization. The framework was used initially in continuous time, which required an in-depth study of the dynamical behaviour (state jumps, Zenoness, splitting of trajectories, etc.) of these systems. As a consequence, the issue of well-posedness (existence and uniqueness of a trajectory giving an initial condition) received a lot of attention and the main results will be discussed. In discrete time the issue is far less complex.

To obtain discrete-time counterparts of complementarity systems, discretization/time-stepping methods have been studied for the purpose of sampled-data control and simulation. We studied the convergence of these non-smooth dynamical systems when the discretization parameter (typically the sample time) goes to zero. For the resulting discrete-time complementarity systems we considered the relationships to other hybrid model classes like piecewise affine systems as defined first by Sontag and mixed logic dynamical systems as introduced by Bemporad and Morari. As methods were found to transfer the models into other forms, the (MPC) control and verification tools as developed for e.g. MLD systems can be directly applied. Also ideas used for analysing for instance stability for piecewise affine systems can be used now for complementarity systems. Some possibilities are presented. Finally, the lines of future work and corresponding projects are discussed that range from fundamental research to industrial application.

Tid och plats: Fredagen den 22 november kl. 11.00 – 12.00 i seminarierum 3721, Institutionen för matematik, KTH, Lindstedtsvägen 25, plan 7.