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The Hong Kong Mathematical Society
(Founded in 1979)

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HONG KONG MATHEMATICAL SOCIETY

ANNUAL GENERAL MEETING 2012

5 May 2012 (Saturday)

2:00-6:30pm

The University of Hong Kong

Venue: Rooms JLG03 and JLG05, Jame Lee Building, HKU.

Schedule of Events:

Invited Talks (Parallel Sessions):

Parallel Session 1

Venue: Room JLG03

2:00-2:30pm

1. **Chunhua Ou (Memorial University of Newfoundland, Canada)**

Title: Diffusion, Chemotaxis and Pattern Formation: A Case Study Via Asymptotic Analysis

Abstract: In this talk, we analyze the effect of diffusion and chemotaxis in a volume-filling model. The existence of patterns can be proved by the topological-degree method. Via an asymptotic analysis, we derive an explicit formula for the stationary patterns. Moreover, based on this explicit formula, we establish the stability criteria and find a selection mechanism of the principal wave modes for the stable stationary solutions in virtue of the estimation of the leading term of principal eigenvalues. We show that all bifurcations except the one at the first location of the bifurcation parameter are unstable, and if the pattern is stable, then its principal wave mode must be a positive integer which minimizes the bifurcation parameter.

Parallel Session 2

Venue: Room JLG05

2:00-2:30pm

1. Xavier Bresson (City U)

Title: Graph Approximation of Continuum Cheeger Cut

Abstract: A challenging problem in machine learning is to infer the geometry of the manifold given a set of noisy, sparse and scattered data points. One successful approach to study the geometry of data points is to use the eigenvectors of the Laplace-Beltrami operator approximated by a suitable normalized graph Laplacian. We propose here to estimate another geometric feature of the manifold, the Cheeger cut. Our main contribution is to show how to correctly normalized the Cheeger cut on a graph so that it converges to the Cheeger cut on a continuum domain. This result allows us to separate the geometry of the manifold from the statistic of points. We present numerical examples that demonstrate the importance of the proposed normalization process to infer the correct geometry.

2:30-3:00pm

2. **Maosheng Xiong (HKUST)**

Title: A family of unit Time-Phase signal sets

Abstract: We present a family of unit signal sets with strong anti-distortion capacity with respect to time and phase shift. Some useful features include: the mathematics involved is elementary, the alphabet size is small, the number of signals can be arbitrarily large with respect to the length, at the expense of the anti-distortion capacity decreasing linearly, and they have low peak-to-average power ratio. They may also satisfy other nice properties.

3:00-3:30pm

3. Delin Chu (National University of Singapore)

Title: Computing Hamiltonian Schur Form

Abstract: Let M be a 2n-by-2n Hamiltonian matrix with no eigenvalues on the imaginary axis. Then there is an orthogonal-symplectic similarity transformation of M to Hamiltonian Schur form, revealing the spectrum and stable invariant subspace of M. This was proved by C. C. Paige and C.Van Loan in a paper published in 1981. The proof given in that paper was nonconstructive. Ever since, the problem of developing a structure-preserving and backward-stable algorithm with complexity O(n^3) to compute the Hamiltonian Schur form of a 2n-by-2n Hamiltonian matrix proved difficult to solve however, so much so that it came to be known as Van Loan's curse. In this talk we will introduce a new method that may meet these criteria for computing the Hamiltonian Schur form of a 2n-by-2n Hamiltonian matrix M without purely imaginary eigenvalues. The new method is structure-preserving and is of complexity O(n^3). It is implemented using orthogonal-symplectic transformations only and many numerical results demonstrate that it performs well and is backward stable in cases where there are no eigenvalues too close to the imaginary axis. This method also leads directly to a new structure preserving algorithm for solving algebraic Riccati equations.

2:30-3:00pm

2. Yongwei Huang (HKBU)

Title: Matrix Rank-One Decomposition Techniques and Applications

Abstract: We present several new rank-one decomposition theorems for positive semidefinite matrices. The matrix rank-one decomposition theorems appear to have wide applications in theory as well as in practice. On the theoretical side, we show the applications to the strong duality for QCQP, S-lemma, convexity of the joint numerical ranges. On the practical side, we show that the matrix rank-one decomposition results can be applied to solve two problems respectively in radar and wireless communications

3:00-3:30pm

3. **Jein-Shan Chen (National Taiwan Normal University)**

Title: Lipschitz Continuity of the Solution Mapping of Symmetric Cone Complementarity Problems

Abstract: This paper investigates the Lipschitz continuity of the solution mapping of symmetric cone (linear or nonlinear) complementarity problems (SCLCP or SCCP, respectively) over Euclidean Jordan algebras. We show that if the transformation has uniform Cartesian P-property, then the solution
mapping of the SCCP is Lipschitz continuous. Moreover, we establish that the monotonicity of mapping and the Lipschitz continuity of solutions of the SCLCP imply ultra P-property, which is a concept recently developed for linear transformations on Euclidean Jordan algebra. For a Lyapunov transformation, we prove that the strong monotonicity property, the ultra P-property, the Cartesian P-property and the Lipschitz continuity of the solutions are all equivalent to each other.

3:30-4:00pm Tea Break

Venue: JLG05

4:00-4:30pm HKMS Annual General Meeting

4:30-4:40pm HKMS Best Thesis Award Presentation Ceremony

4:40-5:30pm Plenary Lecture by Shengli Tan (East China Normal University):

Title: The Best Bound of Abelian Automorphism Groups of Surfaces of General Type

Abstract: We prove that the order of the abelian automorphism group G of a complex surface S of general type is bounded from above by $12.5K_s^2+100$ provided the geometric genus of the surface is at least 5. The upper bound is reached for infinitely many families of surfaces whose geometric genus can be arbitrarily large. We will present also an example to show that the lower bound 5 on the geometric genus can not be replaced by 3. This is a joint work with Xin Lv.

5:30-6:20pm Plenary Lecture by Bob Li (Chinese University of Hong Kong)

Title: Computing by Symmetry

Abstract: The popular 2008 movie "*21*" was based on the story of the *MIT Blackjack Team*, which won $M’s in Las Vegas, Atlantic City, the Caribbean’s, Europe, ... in the early 1990s. I switched the teaching job to another university long before MIT people formed the Team. Before their magnificent tour, the Team tried to get me to join. For that, they had to track me down on the opposite side of the earth at an age before Internet. Why me? I had a theory for exponential speed-up in the computation of Blackjack probabilities. It applied some algebra to tree-search computing. I had fun trying this private theory out at Las Vegas. My advantage over the house started at the very first hand after shuffle. When I finally released the theory in 1989 through a *SIAM* paper, Blackjack was only mentioned as one of the three applications. Clever MIT people saw through the disguise by the serious paper title “*Dynamic programming by exchangeability*.”

For directions to the meeting venue, please refer to

1. Take the MTR to the “Admiralty” station then take a taxi or a bus (No. 23, 40, 40M) and get off at the ``WEST GATE" of HKU (see the map).

2. Then walk up the stairs and go through the bridge to Haking Wong (HW) building.

3. Next take a lift to 4/F of the HW building, turn left and walk through a corridor linking HW and HC buildings.

4. Finally walk up the stairs and they will see/find the JL building.

For a map of HKU's campus, please refer to: