

Newsletter Wednesday, Aug. 12, 2015

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1. ICIAM Today – Wednesday Recap

Highlights from talks:

Peter Henrici Prize Lecture

Eitan Tadmor (University of Maryland, USA) was awarded the Peter Henrici Prize for his original, broad and fundamental contributions to the applied and numerical analysis of nonlinear differential equations and their applications in areas such as fluid dynamics, image processing and social dynamics. The prize is awarded jointly by the Society for Industrial and Applied Mathematics (SIAM) and ETH Zürich every four years for original contributions to applied analysis and numerical analysis and/or for exposition appropriate for applied mathematics and scientific computing. On Tuesday evening, Dr. Tadmor delivered a lecture "*Mathematical aspects of collective dynamics: consensus, the emergence of leaders and social hydrodynamics*". He discussed the dynamics of systems driven by the "social engagement" of agents with their neighbors. An alternative paradigm was proposed based on the tendency of agents "to move ahead " which leads to the formation of trails and emergence of leaders. Finally, Dr. Tadmor concluded that different descriptions of collective dynamics arise when the number of agents tends to infinity, with the formation of Dirac masses at the kinetic level of description, and critical thresholds at the level of social hydrodynamics.

Collatz Prize Lecture

Annalisa Buffa (Istituto di Matematica Applicata e Tecnologie Informatiche, Italy) delivered a prize lecture titled "*Refinement strategies for spline based methods*". Due to the advent of isogeometric analysis, the use of splines as a tool for the discretisation of partial differential equation has gained interests in the last ten years. In this context, the development of methods capable of local refinement and adaptivity is extremely important as they alleviate the constraints on meshing imposed by the tensor product structure of spline spaces. Dr. Buffa presented her recent contributions to this field with a special attention to two approaches: T-splines and hierarchical splines.

Maxwell Prize Lecture

Jean-Michel Coron (Université Pierre et Marie Curie, France) delivered a prize lecture titled "*Stabilization of control systems: From the water clocks to the regulation of rivers*". In his talk, Dr.

Coron first presented some pioneer devices and works on the stabilization issue which is a fundamental problem in the control systems. Some more recent results were then mentioned and an interesting application to the regulation of rivers was provided.

Invited lectures

Martin Hairer (Warwick University, UK) gave a stimulating talk titled "*Weak universality of the KPZ equation*". In his talk, Dr. Hairer showed the fact that there exists a rather large class of continuous models of interface propagation for which convergence to KPZ can be proven rigorously. With the help of an interesting twist, both the proof of convergence and the identification of the limit are given based on recently developed theory of regularity structures.

Ian Sloan (The University of New South Wales, Australia) delivered an invited talk "*What's new in high-dimensional integration? – designing Quasi Monte Carlo for applications*". In his talk, Dr. Sloan described a recent approach to high-dimensional integration. The basic idea is to especially design a Quasi Monte Carlo rule (i.e. an equal weight rule) to match a particular problem.

Bob Bixby (Gurobi Optimization, Inc., USA) presented an impressive invited talk "*Computational Progress in Linear and Mixed Integer Programming*". The central to this talk is the description of the remarkable performance improvements in mixed-integer programming (MIP) over the last 25 years and the mathematical underpinnings. The modern linear programming (LP) codes are now capable of robustly and efficiently solving instances with multiple millions of variables and constraints. With these LP advances as a foundation, MIP then provides a mathematical framework that enables the representation and solution to provable optimality of a wide range of real-world planning and scheduling models, this in spite of the fact that MIP is NP-hard.

Zuowei Shen (National University of Singapore, Singapore) gave an invited talk "*Image Restoration: A Data-Driven Perspective*". Dr. Shen reviewed the development of the wavelet frame (or more general redundant system) based approach for image restoration from a data-driven perspective. For approximating any function, including images, a wavelet frame is a good system because it is capable of effectively capturing both global patterns and local features of the function. Dr. Shen showed how algorithms of wavelet frame based image restoration are developed via the generic knowledge of images and how specific information of a given image can be used to further improve the models and algorithms. Through this process, some insights and understandings of the wavelet frame based approach for image restoration were revealed. This talk also leads to new ideas on how to analyze more complex data sets generated from other real life problems.

Barbara Wohlmuth (Technische Universität München, Germany) delivered an invited talk "*Solution Techniques for the Stokes System: A Priori and A Posteriori Modifications, Resilient Algorithms*". Dr. Wohlmuth proposed modifications to standard low order finite element approximations of the Stokes system with the goal of improving both the approximation quality and the parallel algebraic solution process. Different from standard finite element techniques, they did not modify or enrich the approximation spaces but modified the operator itself to ensure fundamental physical properties such as mass and energy conservation. Special local a priori correction techniques at reentrant corners lead to an improved representation of the energy in the discrete system and can

suppress the global pollution effect. Local mass conservation can be achieved by an a posteriori correction to the finite element flux. This avoids artifacts in coupled multi-physics transport problems. Finally, hardware failures in large supercomputers may lead to a loss of data in solution subdomains. Within parallel multigrid, this can be compensated by the accelerated solution of local subproblems. These resilient algorithms will gain importance on future extreme scale computing systems.

Yinyu Ye (Stanford University, USA) presented an invited lecture "*On Convergence of the Multi-Block Alternating Direction Method of Multipliers*". In his talk, Dr. Ye summarized recent approaches and results on the alternating direction method of multipliers (ADMM). He also illustrated an example to show the direct extension of ADMM is not necessarily convergent with three or more blocks. Finally, Dr. Ye presented the result that, if in each iteration one randomly and independently permutes the updating order of variable blocks followed by the standard Lagrangian multiplier update, then ADMM will converge in expectation when solving certain convex optimization problems.

Yasumasa Nishiura (Tohoku University, Japan) delivered an invited talk "*On the interplay between intrinsic and extrinsic instabilities of spatially localized patterns*". Both the spatially localized dissipative structures and the adaptive switching of dynamics stem from an interplay between the intrinsic instability of each localized pattern and the strength of external signals. To understand such an interplay, Dr. Nishiura explored the global geometric interrelation amongst all relevant solution branches of a corresponding system with approximate unfolding parameters. He also illustrated the impact of this approach by presenting its application in relation to the decision making process of amoeboid locomotion and hierarchical structures of ordered patterns arising in reaction diffusion systems and binary fluids.

2. What to look for on Thursday

Public Lecture

Time: 8:30-9:30

Title: Without Mathematics and Supercomputings, No Effective Risk Reduction of Natural Disasters

Room: Ballroom A

Speaker: **Qingcun Zeng, Institute of Atmospheric Physics, CAS**

Chair: Tatsien Li

CSIAM Outstanding Young Scholars Prize Lectures

Time: 10:00-12:00

Room: Ballroom A

Speaker 1: **Qizhai Li, Academy of Mathematics and Systems Sciences, CAS**

Title 1: A two-phase procedure in ordinal-trait genetic association study

Speaker 2: **Jian Sun, Xi'an Jiaotong University**

Title 2: Learning discriminative markov random field models for imaging restoration

Speaker 3: **Zhixin Liu, Academy of Mathematics and Systems Sciences, CAS**

Title 3: Analysis, intervention and distributed estimation of multi-agent systems

Speaker 4: **Hao Wu, Fudan University**

Title 4: Well-posedness and stability of the full ericksen-leslie system for incompressible nematic liquid crystal flows

MathsWork Talk

Time: 18:30

Room: Ballroom C

Title: Why Creating Mathematical Algorithms Will Be The "New Literacy"

Speaker: **Wei Wang**, senior statistics and machine learning software developer at MathWorks. Wei joined MathWorks in 2011. He is an expert on machine learning algorithms for big data. He has a PhD in electrical engineering from Michigan Tech.

Introduction: Applied mathematics are the foundation of algorithms and many complex algorithms run large bits of our modern lives. Wherever your career takes you, modeling and high level algorithmic design are the lifelong skills to build.

Sonia Kovalevsky Lecture

Time: 19:00-20:00

Title: Predicting Population Extinction, Disease Outbreaks and Species Invasions Using Branching Processes

Room: Ballroom C

Speaker: **Linda J. S. Allen, Texas Tech University, USA**

Chair: L. Pamela Cook

3. Notice

Due to the meeting of Xiao Mi holding at plenary A on 13th August, for security and privacy reasons, please note that three escalators from Third North Foyer to the Fourth Olympic Green Foyer have to be closed on 13th between 12:00 to 14:00. However, if you have to go to the fourth floor, you are suggested to take the sightseeing lift or other lifts. Sorry about the inconvenience.

All the talks originally scheduled in Room 102, 105, 108 and 111 will be delivered in the Plenary Hall B on the fourth floor.

Program Updates on Thursday and Friday

MS-Th-BC-36 (10:00-12:00)

Room: **409**

switch talks between Ziqing Xie and Xindan Gao

Title: The Roles of Pseudo-Differential Operators and Related Mathematics in Industries and Technologies

Speaker: Wong, M.W. (York University)

Move from MS-Fr-E-44-1 to MS-Th-E-44-1

MS-Th-E-08 (16:00-18:00) and **MS-Fr-D-08** (13:30-15:30)

Room: **202B**

- (a) switch talks between H. Kang and B. Zhang.
- (b) cancel the talk of L. Demanet.
- (c) replacement of J. Schotland by Y. Wang.

MS-Th-E-06 (16:00-18:30) and **MS-Fr-E-06** (16:00-18:00)

Room: **201**

- (a) cancel the talk of Kody Law (MS-Th-E-06-3)
- (b) cancel the talk of Themistoklis Sapsis (MS-Fr-E-06-4)

The following talk

MS-Fr-D-14-3

Time: 14:30--15:00

Title: Identification of the Point Sources in Some Stochastic Wave Equations

Speaker: Guanglin, Rang (Wuhan Univ.)

has been changed to

New Title: Invariant Gibbs measures and almost surely global wellposedness for the periodic Ostrovsky equation

New Speaker: Yan, Wei (Henan Normal Univ.)

Cancellation

- MS-Th-BC-36-4
Title: A numerical far field boundary condition for anisotropic Laplace operators
Speaker(s): Wang, Wei-Cheng (Department of Mathematics, National TsingHua University)
- MS-Th-D-30-3
Title: Multiscale Analysis and Algorithms for Optimal Control and Optimal Design in Composite Materials
Speaker(s): Cao, Liqun (Chinese Acad. of Sci.)
- MS-Th-E-30-3
Title: A LEAST-SQUARES MIXED ELEMENT APPROXIMATION OF ELLIPTIC OPTIMAL CONTROL PROBLEMS
Speaker(s): Rui, Hongxing (Department of Mathematics, Shandong Univ.); Fu, Hongfei (China Univ. of Petroleum)
- MS-Th-E-44-1
Title: Modulation spaces, harmonic analysis and pseudo-differential operators
Speaker(s): Toft, Joachim (Department of mathematics, Linnaeus Univ.)

- MS-Th-E-44-3
Title: A Frame of Discrete Orthogonal Stockwell Transform
Speaker(s): Berra, Michele (Univ. of Turin)
- MS-Fr-D-44-1
Title: Advances in Queueing Models' Research
Speaker(s): Gupur, Geni (Xinjiang Univ.)
- MS-Fr-E-19-4
Title: Estimates for the homogeneous Landau equation with Coulomb potential
Speaker(s): Gualdani, Maria (George Washington Univ.)
- MS-Fr-E-30-1
Title: Modeling and Computation of Transboundary Industrial Pollution with Emission Permits Trading by Stochastic Differential Game
Speaker(s): Zhang, Shuhua (Tianjin University of Finance and Economics)
- MS-Fr-E-30-4
Title: Model-free implied volatility, quadratic variation and risk-neutral density
Speaker(s): Yang, Hongtao (University of Nevada Las Vegas)

4. Found & Lost

- found a Casio EDIFICE WR100M watch/ at Ballroom C/ on Tuesday afternoon 7:00~8:00
- found an **ICIAM** ID card named Jin, Xie
- found an information bag at fourth floor/ on Monday/ with no personal belongs
- found an information bag at third floor/ on Monday/ with no personal belongs
- found a room keycard of Beijing Beichen InterContinental at 210B/ on Wednesday morning
- found a grey hat on Tuesday
- someone lost a green pen bag at second floor 206B/ on Tuesday
- someone lost a keyboard case at third floor coffee shop or second floor 203B/ on Wednesday
- someone lost an information bag at third floor coffee break spot (right hand side)
- someone lost a bag at Ballroom C/ on Wednesday morning
- someone lost a red room keycard of Peony Garden Hotel

For further information please contact the Found and Lost desk on the 1st floor (near by the registration desk).