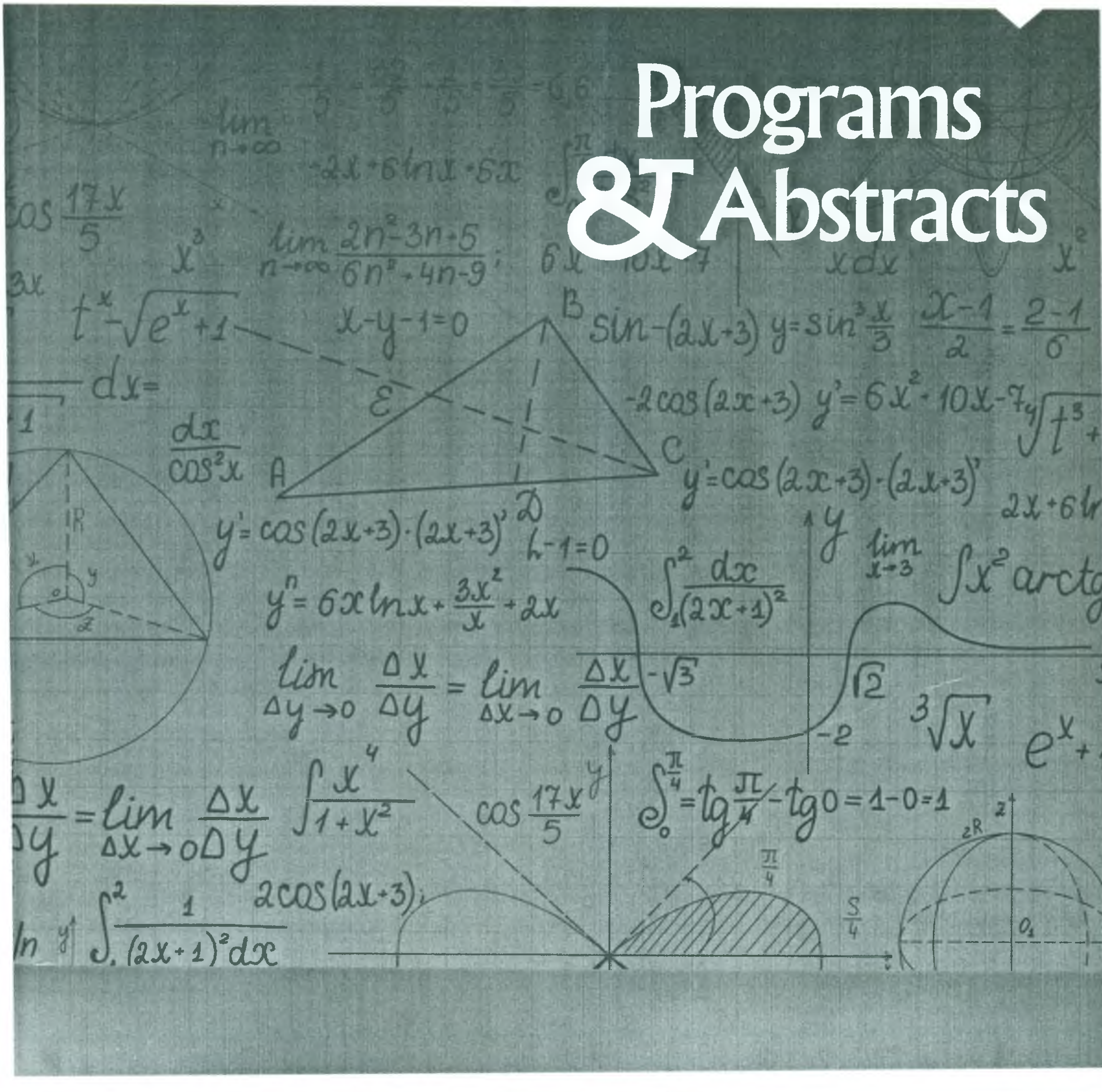
ISAAC 2015

10th International ISAAC Congress

第10屆分析應用及計算國際會議

2015/8/3-8 • University of Macau

Programs & Abstracts



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Program for ISAAC 2015

http://www.fst.umac.mo/conference/isaac2015/index.html

3rd August–8th August, 2015

University of Macau

Macao, China

Local Organizing Committee:

Tao Qian (Chair)

C. L. Philip Chen (Honorary co-chair)

Members (in the alphabetical order)

Yang Chen

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Kit Ian Kou

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Yue-Fei Wang

Outline of the structure and venue of ISAAC 2015

The talks consist of plenary talks and invited talks. Each plenary talk lasts 60 minutes, and each invited talk lasts 30 minutes. The plenary ones will be given in the mornings and in the early afternoons from the Monday to the Friday. The rest time will be for the invited talks, lasting to the Saturday morning. There is also an evening lecture on the 4th of August.

The main lecture hall is E4-G078, where the opening and award ceremonies and the plenary lectures will be held. The lecture hall will also be occasionally used by combined–session–talks.

The lecture rooms for the invited (session) talks are: E4-1051, E4-1052, E4-3052, E4-3053, E4-3054, E4-3055, E4-3056, E4-3062, E4-3063 and E4-3064.

Coffee and tea breaks will be held on the ground floor of E4 Building. The registration desks will be there, too.

There is wireless internet available via the users name "guest1689", and the password "niyk1339".

Operator theory in splitting methods

Alexander Ostermann
University of Innsbruck, Austria
email: alexander.ostermann@uibk.ac.at

Abstract The numerical solution of an abstract evolution equation requires the time integration of the spatially discretized problem. This can be carried out by any method suited for stiff problems, e.g., various implicit Runge–Kutta methods, backward differentiation formulas, or exponential integrators. The properties of the time integration (like stability and order of convergence) can often be analyzed by studying the abstract initial value problem without any space discretization. It is well known that the order of convergence strongly depends on the smoothness of the solution (and the data), the type of boundary conditions, and the employed norm.

Splitting methods form an important class of competitive time integration schemes for certain types of evolution equations. Despite of their extensive use in real–life applications, these methods are still far from being fully understood. As an example we discuss reaction–diffusion equations, where the diffusion is modeled by the Laplacian and the reaction by a (locally acting) non–linearity, respectively. Separating the diffusion from the reaction gives, on the one hand, a free heat equation that can often by solved efficiently by fast Fourier techniques and, on the other hand, a set of ordinary differential equations that describe the local reaction at each grid point. However, the above approach requires some care if the problem is endowed with non–periodic boundary conditions. In this case, a straightforward application of splitting will often lead to strong order reduction and consequently to computational inefficiency. In the talk, we will exemplify the problem of boundary conditions in splitting methods with the help of typical examples. Based on these observations and further theoretical investigations, we will present remedies to avoid such order reductions.

The talk is based on joint work with Lukas Einkemmer.

Numerical solutions of Navier–Stokes equations

K. Shakenov
Al-Farabi Kazakh National University, Almaty, Kazakhstan
email: shakenov2000@mail.ru

Abstract Let the dimension of the space is $n = 3$ and domain Ω is bounded. We assume that $\mathbf{u_0}$ is given, $\mathbf{u_0} \in \mathbf{H}$ and, for simplicity, $\mathbf{f}$ is assumed to be in $\mathbf{L}^2(0,T;\mathbf{H})$, $\mathbf{f} \in \mathbf{L}^2(0,T;\mathbf{H})$. For any given $\varepsilon > 0$, we consider the following initial boundary value problem [1]. To find $\mathbf{u}_\varepsilon = \{u_{1\varepsilon}, ..., u_{n\varepsilon}\}$, a vector function from $Q = \Omega \times (0,T)$ into $\mathbb{R}^n$, such that:

(25) $$\frac{\partial \mathbf{u}_\varepsilon}{\partial t} - \nu\Delta\mathbf{u}_\varepsilon + \sum_{i=1}^{n} u_{i\varepsilon} D_i \mathbf{u}_\varepsilon + \frac{1}{2}\left(\operatorname{div}\mathbf{u}_\varepsilon\right)\mathbf{u}_\varepsilon - \frac{1}{\varepsilon}\operatorname{grad}\operatorname{div}\mathbf{u}_\varepsilon = \mathbf{f} \ \text{ in } \ Q,$$

(26) $$\mathbf{u}_\varepsilon = 0, \ \ x \in \partial\Omega, \ \ t \in (0,T),$$

(27) $$\mathbf{u}_\varepsilon = \mathbf{u}_0, \ \text{ at } \ t = 0.$$

The equation (25) write in the form of

(28) $$\frac{\partial \mathbf{u}_\varepsilon}{\partial t} + \sum_{i=1}^{n} L_i(\mathbf{u}_\varepsilon) - \frac{1}{\varepsilon}\operatorname{grad}\operatorname{div}\mathbf{u}_\varepsilon = \mathbf{f}.$$

where $L_i(\mathbf{v}) = -\nu \dfrac{\partial^2 \mathbf{v}}{\partial x_i^2} + v_i \dfrac{\partial \mathbf{v}}{\partial x_i} + \dfrac{1}{2}\dfrac{\partial v_i}{\partial x_i}\mathbf{v}$. We approximate each operator L_i by three means. Then, obtained systems is solved numerically by fractional step method, iterative method and Monte Carlo methods [2], [3].

Bibliography

[1] Temam, R., *Navier–Stokes equations. Theory and numerical analysis*, North–Holland Publishing Company Amsterdam · New York · Oxford (1979).

[2] Ladyzhenskaya. O. A., *Mathematical questions of the dynamics of viscous incompressible fluids*, Nauka Moscow (1970).

[3] Ermakov, S. M., Shakenov, K. K., *On the applications of the Monte Carlo method to Navier–Stokes equations* Bull. Leningrad State University, Series Mathematics, Mechanics, Astronomy, **6267–B86**, 1–14 (1986).

13. Nonlinear partial differential equations

Organizers: V. Georgiev (Pisa), T. Ozawa (Tokyo)

The session intends to discuss various nonlinear partial differential equations in mathematical physics. Among possible arguments the following ones shall be discussed: existence and qualitative properties of the solutions, existence of wave operators and scattering for these problems, stability of solitary waves and other special solutions.

Multiple solutions for a class of the cooperative elliptic systems with subcritical Sobolev exponents

Q-Heung Choi[1], Tacksun Jung[2]
1 Inha University, Incheon, Republic of Korea
2 Kunsan National University, Kunsan, Republic of Korea
email: qheung@inha.ac.kr

Abstract This paper is devoted to investigate the multiple solutions for a class of the cooperative elliptic systems involving subcritical Sobolev exponents on the bounded domain with smooth boundary. We first show the uniqueness and the negativity of the solution for the linear systems of the problem via the direct calculation. We next use the variational method and the mountain pass theorem in the critical point theory.

Propagation of coherent states

Lysianne Hari
Department of Mathematics, University of Pisa, Italy
email: lhary@mail.dm.unipi.it

Abstract We study the propagation of a coherent state for systems of coupled Schrödinger equations in the semi-classical limit. We will consider two different cases, leading to different physical phenomena.

First, couplings will be induced by a cubic nonlinearity and some stability of the solution will be studied: an initial coherent state polarized along an eigenvector of the potential remains at leading order in the same eigenspace ("adiabaticity").

Sessions on Friday, 7th August

Time	E4-1051	E4-1052	E4-3052	E4-3053	E4-3054
11:00–11:30	K. I. Kou	K. Nishihara	L. Cohen	B. Golubov & S. Volosivets	W. J. Yuan
11:30–12:00	J. F. Zhu	M. A. Djaouti	G. Gu	B. S. Kim	T. B. Cao
12:00–12:30	X. Dong	M. Ruziev	V. Catană	J. Rappoport	J. S. Xu
14:00–14:30	A. Ostermann	L. Karp	G. Pfander	A. Morimoto	J. M. Qi
14:30–15:00	L. Einkemmer	X. Lu	D. Walnut	N. Ikawa	G. W. Zhang
15:00–15:30	H. Mena	Y. Liu	V. Turunen	T. Noi	Y. Y. Huo
15:30–16:00	K. Shakenov	H. Nakazawa	G. Garello	K. Fujita	L. P. Chen
16:30–17:00	X. Z. Huang	S. E. Rebiai	Ervin Sejdić	K. Mizohata	Z. B. Huang
17:00–17:30	X. D. Chen	M. D'Abbicco	H. M. Zhu	K. Fujinoki	Y. M. Liu
17:30–18:00	M. S. Liu	S. Yoshikawa			X. M. Li

Time	E4-3055	E4-3056	E4-3062	E4-3063	E4-3064
11:00–11:30	B. L. Zhang	H. Vernaeve	J. Wirth	Serovajsky	M. Piekarczyk
11:30–12:00	Gurlebeck	A. Debrouwere	V. Vasilyev	Raikhan	R. R. Lin
12:00–12:30	Z. X. Zhang	A. Lecke	C. H. Chen	Rajabov	
14:00–14:30	Grigoriev	Sage	H. Yamane	Rajabova	R. Pukhtaievych
14:30–15:00	Di Teodoro		D. Suragen	Vanegas	V. Shpakivskyi
15:00–15:30	Alexeyeva	Liu	I. Trooshin	Wang	P. T. W. Ng
15:30–16:00			Obidjon Abdullaev	Lin	R. Salimov
16:30–17:00	Y. Y. Yang	Jahnke	R. Akylzhanov	Tungatarov	L. Zhang
17:00–17:30	M. Schwarz			Begehr	A. D. Asmaa
17:30–18:00	M. Oberguggenberger				

Sessions on Saturday, 8th August

Time	E4-1051	E4-1052	E4-3052	E4-3053	E4-3054	E4-3055
9:00–9:30	Talks in Session 1	Talks in Session 23	J. M. Liu	Y. Mo	Bogatyrev	W. Mi
9:30–10:00			C. M. Zou	W. X. Mai		C. F. Wu
10:00–10:30			X. X. Hu			
10:30–11:00			D. Cheng			