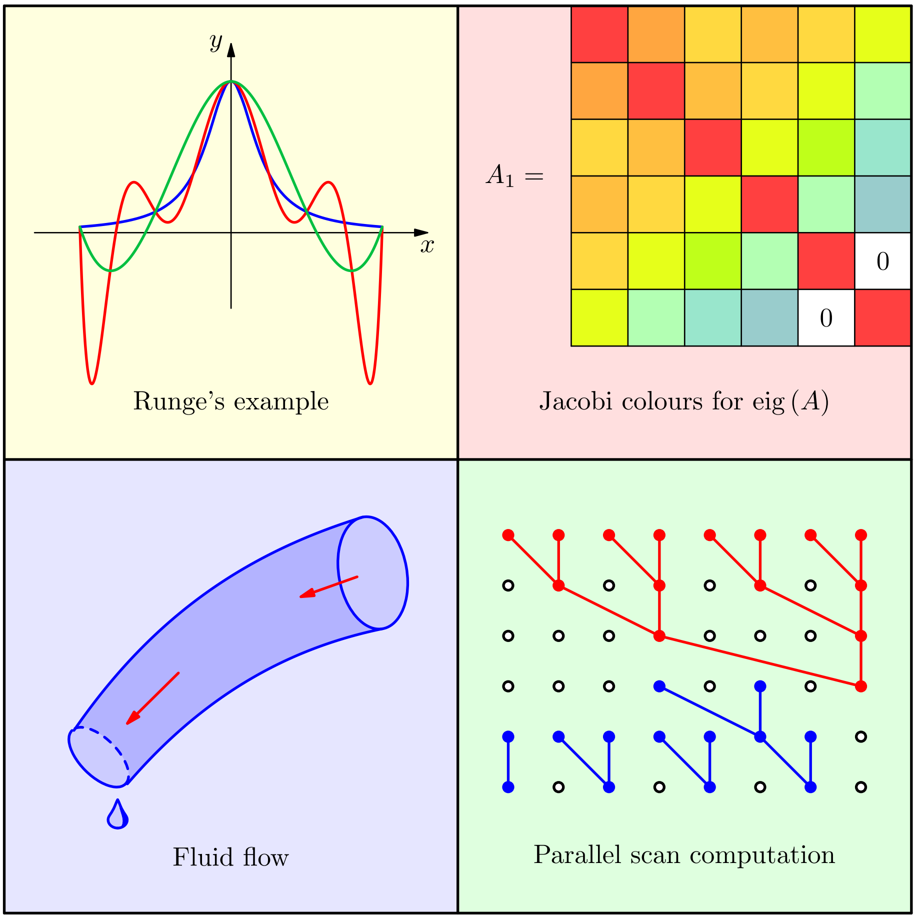
Conference on

APPLIED MATHEMATICS
AND
SCIENTIFIC COMPUTING

Zadar, Croatia
September 14–18, 2009



Runge's example

Jacobi colours for eig (A)

Fluid flow

Parallel scan computation

SCIENTIFIC PROGRAM

Monday, September 14 – Morning Session

8:45– 9:00	**Conference opening – Mladen Rogina**

Time	**Chair: John J. H. Miller**
9:00– 9:45	Alain Bourgeat Gas migration in a nuclear waste repository; a unified modelling of fully and partially saturated porous materials, page 9

Time	**Chair: Ibrahim Aganović**
10:05–10:30	Tina Bosner Basis of splines associated with singularly perturbed advection–diffusion problems, page 20
10:30–10:55	Ibrahim Aganović, Josip Tambača and Zvonimir Tutek Reduction of dimension for elliptic systems, page 15
10:55–11:20	Boris Muha and Zvonimir Tutek Numerical analysis of a free piston problem, page 35

Time	**Chair: Zvonimir Tutek**
11:40–12:05	Roderick Melnik and Linxiang Wang Mathematical models and numerical methods for coupled nonlinear problems of dynamic thermoelasticity, page 34
12:05–12:30	Maroje Marohnić and Josip Tambača Plate embedded in an elastic medium, page 31

Monday, September 14 – Afternoon Session

Time	Chair: Zlatko Drmač
15:00–15:45	Moshe Goldberg Stability of the θ-method for parabolic initial-value problems, page 11

Time	Chair: Nenad Antonić
16:05–16:30	Andrija Raguž Asymptotics for a class of Ginzburg-Landau functionals with oscillating penalizing term in one dimension, page 39
16:30–16:55	Krešimir Burazin and Nenad Antonić How to pose boundary conditions for Friedrichs systems?, page 21
16:55–17:20	Marko Vrdoljak Relaxation of inverse problems by homogenisation method, page 45

Time	Chair: Dragan Jukić
17:40–18:05	Dragan Jukić and Darija Marković On nonlinear weighted least squares fitting of the three-parameter inverse Weibull distribution, page 29
18:05–18:30	Krešimir Veselić On overdamped systems, page 43

Tuesday, September 15 – Morning Session

Time	**Chair: Rudolf Scitovski**
9:00– 9:45	Tom Lyche Analysis aware modeling, page 12

Time	**Chair: Miljenko Marušić**
10:05–10:30	Patrick Chenin Interpolation spline under tension with constraints, page 22
10:30–10:55	Gašper Jaklič and Emil Žagar Minimizing curvature deviation by Hermite cubics, page 29
10:55–11:20	Gašper Jaklič, Jernej Kozak, Marjeta Krajnc, Vito Vitrih and Emil Žagar High order parametric polynomial approximation of conic sections, page 28

Time	**Chair: Alain Bourgeat**
11:40–12:05	Arif Amirov, Mustafa Yildiz, Sedat Cevikel and Fikret Gölgeleyen On the approximate solution of an overdetermined coefficient inverse problem for the kinetic equation, page 18
12:05–12:30	Arif Amirov, Bayram Heydarov and Zekeriya Ustaoğlu Solvability of a two dimensional coefficient inverse problem for transport equation and a numerical method, page 17

Tuesday, September 15 – Afternoon Session

Time	**Chair: Tom Lyche**
15:00–15:45	Carla Manni Corner cutting, optimal bases and Hermite subdivision schemes, page 12

Time	**Chair: Vjeran Hari**
16:05–16:30	Christopher Beattie, Zlatko Drmač and Serkan Gugercin Iterative rational Krylov method for optimal $\mathcal{H}_2$ model reduction – numerical implementation issues, page 19
16:30–16:55	Josip Matejaš and Vjeran Hari Accuracy of the Kogbetliantz method on scaled diagonally dominant triangular matrices, page 33
16:55–17:20	Vjeran Hari, Saša Singer, Vedran Novaković and Sanja Singer Parallelization and pivoting in one-sided Jacobi algorithms, page 26

Time	**Chair: Sanja Singer**
17:40–18:05	Saša Singer and Dirk Laurie Fast and accurate computation of Gaussian quadrature for tension powers, page 42
18:05–18:30	Vedran Novaković, Sanja Singer and Saša Singer Cardinal splines, Töplitz matrices and circulants, page 37

Wednesday, September 16 – Excursion to Kornati

Thursday, September 17 – Morning Session

Time	Chair: Mladen Rogina
9:00– 9:45	M. Paramasivam, S. Valarmathi and John J. H. Miller A parameter–uniform finite difference method for a singularly perturbed linear system of second order ordinary differential equations . . . , page 14

Time	Chair: Carla Manni
10:05–10:30	Kristian Sabo, Rudolf Scitovski and Ivan Vazler Searching for a best LAD-solution of an overdetermined system of linear equations motivated by searching for a best LAD-hyperplane . . . , page 40
10:30–10:55	Vito Vitrih Lattices on simplicial partitions with holes, page 44
10:55–11:20	Miljenko Marušić, Darija Marković and Dragan Jukić Least squares fitting the three-parameter inverse Weibull density, page 32

Time	Chair: Mladen Jurak
11:40–12:05	Martin Lazar and Darko Mitrović The velocity averaging for a heat type equation, page 30
12:05–12:30	Nelida Črnjarić-Žic, Bojan Crnković and Senka Maćešić Practical analysis of SSP time integration methods for hyperbolic conservation laws, page 23

Thursday, September 17 – Afternoon Session

Time	Chair: Eduard Marušić–Paloka
15:00–15:45	Didier Bresch, Benoît Desjardins and Emmanuel Grenier Incompressible limit and non-isentropic fluids, page 10

Time	Chair: Didier Bresch
16:05–16:30	Nermina Mujaković and Ivan Dražić The Cauchy problem for one-dimensional flow of a compressible viscous fluid: stabilization of the solution, page 36
16:30–16:55	Brahim Amaziane, Mladen Jurak and Ana Žgaljić Keko Modeling two-phase compressible flow in porous media using the concept of global pressure, page 16
16:55–17:20	Josip Tambača and Igor Velčić Lower dimensional models in micropolar elasticity, page 43

Time	Chair: Josip Tambača
17:40–18:05	Tomislav Fratrović Low-volume fraction limit for polymer fluids, page 24
18:05–18:30	Stefan Ivić, Luka Sopta and Siniša Družeta Optimization of submarine pipeline laying, page 27

Friday, September 18 – Morning Session

Time	**Chair: Krešimir Veselić**
9:00– 9:25	Liselott Flodén, Anders Holmbom, Marianne Olsson and Jens Persson Some notes on two-scale convergence and its generalizations, page 24
9:25– 9:50	Josip Pečarić, Mihaela Ribičić Penava Sharp integral inequalities based on general four-point formulae via an extension of Montgomery identity, page 38
9:50–10:15	Ambroz Čivljak and Ljuban Dedić Approximation of functions via Euler harmonic identities for measures, page 22

Time	**Chair: Roderick Melnik**
10:35–11:00	Adrijana Radošević, Jerko Škifić and Luka Sopta Mathematical model of a coal-fired thermal power plant, page 38
11:00–11:25	Tarik Hadzibeganovic and Matjaž Perc Evidence for deterministic chaos in human eye movements, page 25
11:25–11:50	Sergey Shindin, Naben Parumasur Numerical analysis of the Caughley model from ecology, page 41

11:50–12:00	**Conference closing – Mladen Rogina**

INVITED LECTURES

MONDAY, 09:00–09:45

Gas migration in a nuclear waste repository; A unified modelling of fully and partially saturated porous materials

Alain Bourgeat

Abstract. Most of the research in the field of multiphase flows in porous media, over the past four decades, has been motivated by applications either on unsaturated groundwater flows or on underground petroleum reservoirs. Most recently, multiphase flows have generated serious interest among engineers concerned with deep geological repository for radioactive waste, due to the hydrogen gas generation, coming from anaerobic corrosion of the steel engineered barriers.

In this situation, there are two phases "liquid" and "gas", and the gas phase has two components, water and pure hydrogen. An outstanding physical and mathematical problem in simulation of such multiphase flow is the appearance disappearance of one of the phases, leading to the degeneracy of the equations satisfied by the saturation. In order to overcome this difficulty, we present a new formulation, which doesn't degenerate, based on new variables (total hydrogen mass density and liquid pressure).

We will introduce and motivate this new model, present an existence result for this formulation, with small data, and finally we will show by means of numerical simulations the practical accuracy of this model.

ALAIN BOURGEAT, Université de Lyon, Université Lyon 1, CNRS UMR 5208 Institut Camille Jordan 69200 Villeurbanne, France
e–mail: bourgeat@mcs.univ-lyon1.fr
http://math.univ-lyon1.fr/~bourgeat/

Thursday, 15:00–15:45

Incompressible limit and non-isentropic fluids

Didier Bresch, Benoît Desjardins and Emmanuel Grenier

Abstract. The aim of this talk is to present mathematical difficulties and first partial answer on incompressible limit for non-isentropic fluids in the periodic case. After recalling briefly the isentropic case, we will present previous works in the whole space or in the exterior domain case and we will discuss problems coming from the fact that acoustic wave equations involve variable coefficients depending on space and time in the periodic case. This implies resonance phenomena but also crossing and multiple eigenvalues. We will present measure type estimates based on transversality properties and explain why flows could avoid the resonant set for almost all initial data. This will help to conclude and who in fact that the limit dynamics, in the ill prepared case, would be given by a similar system as the one studied by Bresch, Desjardins, Grenier and Lin (2002) for almost all initial data.

Didier Bresch, Université de Savoie UFR SFA, Campus Scientifique, 73376 Le Bourget-du-Lac Cedex, France
e–mail: `Didier.Bresch@univ-savoie.fr`

Benoît Desjardins, Commissariat à l'Energie Atomique, CEA/DIF, B.P. 12 91680 Bruyeres le Châtel, France
e–mail: `benoit.desjardins@cea.fr`

Emmanuel Grenier, Unité de Mathématiques Pures et Appliquées, École Normale Supérieure de Lyon, 46 allée d'Italie, 69364 Lyon Cedex 07, France
e–mail: `egrenier@umpa.ens-lyon.fr`
`http://www.umpa.ens-lyon.fr/~egrenier/`

MONDAY, 15:00–15:45

Stability of the θ-method for parabolic initial-value problems

Moshe Goldberg

Abstract. The purpose of this talk is to discuss stability criteria for the θ-Method for parabolic initial-value problems of the form

$$\frac{\partial \mathbf{u}(\mathbf{x},t)}{\partial t} = \sum_{1\le p\le q\le s} A_{pq} \frac{\partial^2 \mathbf{u}(\mathbf{x},t)}{\partial x_p \partial x_q} + \sum_{1\le p\le s} B_p \frac{\partial \mathbf{u}(\mathbf{x},t)}{\partial x_p} + C\mathbf{u}(\mathbf{x},t),$$

$$\mathbf{u}(\mathbf{x},0) = \mathbf{f}(\mathbf{x}), \quad \mathbf{x} = (x_1,\dots,x_s) \in \mathbb{R}^s, \quad 0 \le t \le T,$$

where A_{pq}, B_p, and C are constant matrices. This method is a well-known family of finite-difference approximations depending on a parameter θ, $0 \le \theta \le 1$, which includes the Euler Scheme ($\theta = 0$), the Crank–Nicolson Scheme ($\theta = \frac{1}{2}$), and the Backward Euler Scheme ($\theta = 1$). We shall deal with two cases, the classical case where the leading matrix coefficients A_{pq} are Hermitian, and the less conventional case where the A_{pq} are triangular. In the first case, our initial-value problem provides, for example, a model for diffusion of several species where the first- and zero-order terms represent transport and chemical reactions. The second case arises, for instance, in connection with heat and mass transfer with Soret and Dufour cross-effects.

MOSHE GOLDBERG, Department of Mathematics, Technion–Institute of Technology, Haifa 32000, Israel
e–mail: goldberg@math.technion.ac.il

Tuesday, 09:00–09:45

Analysis aware modeling

Tom Lyche

Abstract. A long term goal of Isogeometric analysis is to unify Computer Aided Design (CAD) and Finite Element Analysis (FEA). We demonstrate that in a similar way as how mesh quality is used in traditional FEA to help characterize the impact of the mesh on analysis, an analogous concept of model quality exists within isogeometric analysis. The consequence of these observations is the need for a new area within modeling: analysis-aware modeling.

Tom Lyche, CMA and Department of Informatics, University of Oslo, P.O. Box 1053, Blindern, 0316 Oslo, Norway
e–mail: tom@ifi.uio.no
http://home.ifi.uio.no/tom/

Tuesday, 15:00–15:45

Corner cutting, optimal bases and Hermite subdivision schemes

Carla Manni

Abstract. Corner cutting algorithms and optimal bases (often referred to as B-bases) are foundation stones in CAGD because they provide effective evaluation methods and powerful representation structures for curves and surfaces. They are deeply related and, in particular, both corner cutting algorithms and optimal bases take roots in total positivity which motivates their close connection with shape preservation.

The most popular examples are given by de Casteljau algorithm and Bernstein basis for Bézier curves/surfaces and de Boor algorithm and B-spline basis for splines curves and surfaces. The sequence of coefficients representing a given Bézier (spline curve), with respect to the Bernstein (B-spline) basis provide the best description of the shape of the curve. Moreover, the Bernstein (B-spline) basis has optimal condition number.

The extension of the above mentioned pleasant properties of Bernstein polynomials (B-splines) to bases of general spaces bore the concept of B-bases: totally positive bases with optimal geometric and computational properties.

Subdivision schemes, which consist in repeated applications of some simple rules determining successive refinements of simple starting polygons or grids, are probably the most popular tools to build graphs of functions, curves and surfaces.

Among the others, Hermite subdivision interpolating schemes, i.e., schemes which simultaneously produce a function and its derivatives up to some order interpolating given data, have been proposed and analyzed from different points of view. In particular, it turns out that Hermite interpolating schemes are particularly well suited to preserve some typical geometric properties of the starting data, that is to be shape preserving.

After recalling the crucial role of optimal bases in CAGD, in this talk we present some recent results concerning de Casteljau like corner cutting algorithm and optimal bases for four dimensional spaces of C^1 functions generated by the C^1 Hermite subdivision scheme belonging to the two parameters family introduced in [1] and analyzed by several authors.

As a salient consequence, we obtain efficient algorithms to construct shape preserving interpolating curves by means of the considered subdivision schemes.

References

[1] J.-L. Merrien, *A family of Hermite interpolants by bisection algorithms*, Num. Alg., **2**(1992) 187–200.

Carla Manni, Department of Mathematics, Università di Roma “Tor Vergata”, Via della Ricerca Scientifica 00133 Roma, Italy
e–mail: manni@mat.uniroma2.it
http://www.mat.uniroma2.it/~manni/home_inglese.html

Thursday, 09:00–09:45

A parameter–uniform finite difference method for a singularly perturbed linear system of second order ordinary differential equations of reaction-diffusion type

M. Paramasivam, S. Valarmathi and John J. H. Miller

Abstract. A singularly perturbed linear system of second order ordinary differential equations of reaction-diffusion type with given boundary conditions is considered. The leading term of each equation is multiplied by a small positive parameter. These parameters are assumed to be distinct. The components of the solution exhibit overlapping layers. Shishkin piecewise-uniform meshes are introduced, which are used in conjunction with a classical finite difference discretisation, to construct two numerical methods for solving this problem. It is proved that the numerical approximations obtained with these methods are essentially first, respectively second, order convergent uniformly with respect to all of the parameters.

M. Paramasivam, Department of Mathematics, Bishop Heber College, Tiruchirappalli-620 017, Tamil Nadu, India
e–mail: sivambhcedu@gmail.com

S. Valarmathi, Department of Mathematics, Bishop Heber College, Tiruchirappalli-620 017, Tamil Nadu, India
e–mail: valarmathi07@gmail.com

John J. H. Miller, Institute for Numerical Computation and Analysis, Dublin, Ireland
e–mail: jm@incaireland.org

CONTRIBUTED TALKS

Monday, 10:30–10:55

Reduction of dimension for elliptic systems

Ibrahim Aganović, Josip Tambača and Zvonimir Tutek

Abstract. We consider a boundary-value problem for elliptic system posed on domain in $\mathbb{R}^n$ thin in $n-k$ directions, $k \in \{1, \dots, n-1\}$. We apply the Ansatz of formal expansion method with respect to small thickness of domain to obtain approximation of original problem with a problem posed on domain in $\mathbb{R}^k$.

Models of micropolar rods and plates are derived from $3D$ micropolar elasticity as examples.

Ibrahim Aganović, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: aga@math.hr

Josip Tambača, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: tambaca@math.hr
http://web.math.hr/~tambaca

Zvonimir Tutek, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: tutek@math.hr

Thursday, 16:30–16:55

Modeling two-phase compressible flow in porous media using the concept of global pressure

Brahim Amaziane, Mladen Jurak and Ana Žgaljić Keko

Abstract. Historically, there have been two main approaches to modeling multiphase flow in porous media. The first is based on individual mass conservation equations for each of the fluids, while the second involves manipulations and combination of those balance equations into modified forms, with concomitant introduction of ancillary functions that we will refer to as the fractional-flow or global pressure-saturation formulation.

Numerical methods are very sensitive to the choice of form of the governing equations, so it is worthwhile to revisit the question of the form of the governing equations and exploring the implications of this equation form for a numerical method based on it.

In this talk we are going to present a new formulation that describes immiscible compressible two-phase flow in porous media. The main feature of this new formulation is the introduction of a global pressure. The resulting equations are written in a fractional flow formulation and lead to a coupled system of two PDEs, the global pressure equation which is of nonlinear parabolic type and the saturation equation which is a nonlinear convection–diffusion type equation. This two-equation coupled system can be efficiently solved numerically. We also consider a simplified system in which fluid mass densities are calculated at the global pressure instead of the phase pressure, which leads to a significant simplification of the system.

Finally, we are going to present numerical results obtained by using a finite volume scheme, in order to illustrate the performance of the new and simplified formulation for water-gas flow.

Brahim Amaziane, University of Pau, Mathematics, LMA CNRS-UMR 5142, Av. de l'Université, 64000 Pau, France
e–mail: brahim.amaziane@univ-pau.fr

Mladen Jurak, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: jurak@math.hr
http://www.math.hr/~jurak

Ana Žgaljić Keko, Faculty of Electrical Engineering and Computing, University of Zagreb, Unska 3, 10000 Zagreb, Croatia
e–mail: ana.zgaljic@fer.hr

Tuesday, 12:05–12:30

Solvability of a two dimensional coefficient inverse problem for transport equation and a numerical method

Arif Amirov, Bayram Heydarov and Zekeriya Ustaoğlu

Abstract. This paper presents the solvability results and an efficient approximation method for the solution of a two space dimensional coefficient inverse problem for transport equation. An algorithm is proposed to compute the approximate solution of the problem and to demonstrate the computational feasibility of the given approximation method, some computational experiments are performed and the results are presented. The main difficulty of this study is the overdeterminacy of the problem. In the paper, using some extension of the class of unknown functions, the overdetermined inverse problem is replaced by a related determined one, which is a new and interesting technique of investigating the solvability.

Arif Amirov, Zonguldak Karaelmas University, Incivez, 67100 Zonguldak, Turkey
e–mail: amirov@karaelmas.edu.tr

Bayram Heydarov, Baku Zangi College, Mahsati, 37000 Baku, Azerbaijan
e–mail: mirbay@mail.ru

Zekeriya Ustaoğlu, Zonguldak Karaelmas University, Incivez, 67100 Zonguldak, Turkey
e–mail: zekeriyaustaoglu@karaelmas.edu.tr

TUESDAY, 11:40–12:05

On the approximate solution of an overdetermined coefficient inverse problem for the kinetic equation

Arif Amirov, Mustafa Yildiz, Sedat Cevikel and Fikret Gölgeleyen

Abstract. In this paper, the existence and uniqueness of the solution of an overdetermined coefficient inverse problem for the kinetic equation is proven and an efficient numerical approximation method is developed using finite difference method. This is a new approach since nobody has solved such inverse problems for kinetic equations numerically in the past. A comparison between the exact solution of the problem and the computed approximate solutions with different noise levels is presented.

ARIF AMIROV, Zonguldak Karaelmas University, Incivez, 67100 Zonguldak, Turkey
e–mail: amirov@karaelmas.edu.tr

MUSTAFA YILDIZ, Zonguldak Karaelmas University, Incivez, 67100 Zonguldak, Turkey
e–mail: mustafayildiz2002@hotmail.com

SEDAT CEVIKEL, Zonguldak Karaelmas University, Incivez, 67100 Zonguldak, Turkey
e–mail: scevikel@karaelmas.edu.tr

FIKRET GÖLGELEYEN, Zonguldak Karaelmas University, Incivez, 67100 Zonguldak, Turkey
e–mail: golgeleyen@yahoo.com

Tuesday, 16:05–16:30

Iterative rational Krylov method for optimal $\mathcal{H}_2$ model reduction Numerical implementation issues

Christopher Beattie, Zlatko Drmač and Serkan Gugercin

Abstract. The Iterative Rational Krylov (IRK) method form model order reduction has recently attracted attention because of its effectiveness in real world applications, as well as because of its mathematical elegance.

We analyze the convergence of fixed point iterations behind the IRK idea, and show how proper stopping criterion translates into a backward stability relation. Both issues (convergence, stopping criterion) have impact on the floating point implementation. We will also discuss various issues in mathematical software development.

Christopher Beattie, Department of Mathematics, Virginia Tech, 442 McBryde Hall Blacksburg, VA 24061-0123
e–mail: beattie@math.vt.edu
http://www.math.vt.edu/people/beattie/

Zlatko Drmač, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: drmac@math.hr
http://www.math.hr/~drmac

Serkan Gugercin, Department of Mathematics, Virginia Tech, 442 McBryde Hall Blacksburg, VA 24061-0123
e–mail: gugercin@math.vt.edu
http://www.math.vt.edu/people/gugercin/

Monday, 10:05–10:30

Basis of splines associated with singularly perturbed advection–diffusion problems

Tina Bosner

Abstract. Among fitted-operator methods for solving one-dimensional singular perturbation problems one of the most accurate is the collocation by linear combinations of $\{1, x, \exp(\pm px)\}$, known as tension spline collocation. There exist well established results for determining the 'tension parameter' p, as well as special collocation points, that provide higher order local and global convergence rates. However, if the advection–diffusion–reaction problem is specified in such a way that two boundary internal layers exist, the method is incapable of capturing only one boundary layer, which happens when no reaction term is present. For pure advection–diffusion problem we therefore modify the basis accordingly, including only one exponential, i.e., project the solution to the space locally spanned by $\{1, x, x^2, \exp(px)\}$ where $p > 0$ is the tension parameter. The aim of the paper is to show that in this situation it is still possible to construct a basis of C^1-locally supported functions by a simple knot insertion technique, commonly used in computer aided geometric design. We end by showing that special collocation points can be found, which yield better local and global convergence rates, similar to the tension spline case.

Tina Bosner, Department of Mathematics, University of Zagreb, P.O. Box 335, 10002 Zagreb, Croatia
e–mail: tinab@math.hr
http://www.math.hr/~tinab

Monday, 16:30–16:55

How to pose boundary conditions for Friedrichs systems?

Krešimir Burazin and Nenad Antonić

Abstract. There has been a renewed interest in the theory of Friedrichs' systems recently, which resulted in their new interpretations in the terms of Hilbert spaces. In particular, the admissible boundary conditions have been characterised by two intrinsic geometric conditions, and via boundary operators as well.

While the new abstract approach has provided a simplified framework, its relation to the classical Friedrichs' well-posedness result is still open.

As a first step, we shall investigate under which assumptions do the classical matrix-valued boundary fields determine the boundary operator. The viability of the assumptions will be tested on classical examples.

Krešimir Burazin, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: kburazin@mathos.hr

Nenad Antonić, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: nenad@math.hr

TUESDAY, 10:05–10:30

Interpolation spline under tension with constraints

Patrick Chenin

Abstract. The interpolation problem considered is: given positive values, find an interpolating function which is positive. Convergence results on interpolation spline function under tension show the interest to choose a good parameter τ.

Several authors suggest a solution (in case of one variable) that we remember. In case of one variable, a method is studied with numerical experiments. In case of more variables, a method is suggested by numerical experiments. We use these results as a contribution for the metric interpolation problem.

PATRICK CHENIN, Laboratoire Jean Kuntzman, Université Joseph Fourier, BP 53 F-38051 Grenoble Cedex 9, France
e–mail: Patrick.Chenin@imag.fr

FRIDAY, 09:50–10:15

Approximation of functions via Euler harmonic identities for measures

Ambroz Čivljak and Ljuban Dedić

Abstract. The main aim of this talk is to present some new approximation of functions by using Euler identities which involve real Borel measures and harmonic sequences of functions. Obtained results can be used for approximate calculation of integrals with respect to real Borel measures with very precise error estimates.

AMBROZ ČIVLJAK, American College of Management and Technology, Rochester Institute of Technology, Don Frana Bulića 6, 20000 Dubrovnik, Croatia
e–mail: acivljak@acmt.hr

LJUBAN DEDIĆ, Department of Mathematics, Faculty of Natural Sciences, Mathematics and Education, University of Split, Teslina 12, 21000 Split, Croatia
e–mail: ljuban@pmfst.hr

Thursday, 12:05–12:30

Practical analysis of SSP time integration methods for hyperbolic conservation laws

Nelida Črnjarić-Žic, Bojan Crnković and Senka Maćešić

Abstract. The method of lines approach for solving the hyperbolic conservation laws is based on the idea of splitting discretization process in two stages. First, the spatial discretization is performed by leaving the system continuous in time. This approximation is usually developed in a non-oscillatory manner with a satisfactory spatial accuracy. The obtained semi-discrete system of ordinary differential equations (ODE) is then solved by using some standard time integration methods. However, not all of them give satisfactory results.

In last few years, there is a series of papers dealing with the high order strong stability preserving (SSP) time integration methods that maintain a total variation diminishing (TVD) property of the first order forward Euler method. In this work the optimal SSP Runge-Kutta methods of different order are considered in combination with the upwind and weighted essentially non-oscillatory (WENO) schemes. Furthermore, a new semi-implicit WENO scheme is presented and its properties in combination with different optimal implicit SSP Runge-Kutta methods are studied. The analysis is made on linear and nonlinear scalar equations and on Euler equations for gas dynamics.

Nelida Črnjarić Žic, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: `Nelida.Crnjaric@riteh.hr`

Bojan Crnković, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: `Bojan.Crnkovic@riteh.hr`

Senka Maćešić, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: `Senka.Macesic@riteh.hr`

FRIDAY, 09:00–09:25

Some notes on two-scale convergence and its generalizations

Liselott Flodén, Anders Holmbom, Marianne Olsson and Jens Persson

Abstract. We discuss techniques for the homogenization of linear and non-linear parabolic equations with various numbers of scales in space and time. In this context a certain interpretation of the asymptotic expansion in terms of a mode of convergence of two-scale convergence type is discussed and put in relation to a recent approach (sigma convergence) of Nguetseng for non-periodic homogenization.

LISELOTT FLODÉN, Mid Sweden University, Department of Engineering and Sustainable Development, S-83125 Östersund, Sweden
e–mail: lotta.floden@miun.se

ANDERS HOLMBOM, Mid Sweden University, Department of Engineering and Sustainable Development, S-83125 Östersund, Sweden
e–mail: anders.holmbom@miun.se

MARIANNE OLSSON, Mid Sweden University, Department of Engineering and Sustainable Development, S-83125 Östersund, Sweden
e–mail: marianne.olsson@miun.se

JENS PERSSON, Mid Sweden University, Department of Engineering and Sustainable Development, S-83125 Östersund, Sweden
e–mail: jens.persson@miun.se

THURSDAY, 17:40–18:05

Low-volume fraction limit for polymer fluids

Tomislav Fratrović

Abstract. We study stationary polymer flow through a porous medium modelled as a periodical array of cells consisted of a fluid part and a solid one. Solid parts of a domain present impermeable obstacles, whose impact on fluid flow may be seen as a slowing factor through averaged quantities such as permeability function, obtained by the homogenization process. In that way, the influence of the microstructure is implemented in the homogenized equations through a kind of nonlinear Darcy's law.

Our goal is to find explicit dependency of permeability function on the size η of the obstacles in the unit cell and the so called low-volume fraction limit as $\eta \to 0$. Main difficulties arise from the nonlinear character of power-law viscosity.

Tomislav Fratrović, Faculty of Traffic and Transport Sciences, University of Zagreb, ZUK Borongaj, Borongajska cesta 83A, pp. 170, Zagreb, Croatia
e–mail: tomislav.fratrovic@fpz.hr
http://www.fpz.hr/~tfratrov

Friday, 11:00–11:25

Evidence for deterministic chaos in human eye movements

Tarik Hadzibeganovic and Matjaž Perc

Abstract. This paper examines the possibility that the human eye movements in reading are the output of a system that functions as a relatively simple nonlinear deterministic process. To this effect, we investigate the eye movement behavior with methods of nonlinear time series analysis. The eye fixation data were obtained from a simple reading task by using the outside-in Tobii 1750 eye-tracking technology. We reconstruct the phase space from the observed eye fixations and test it against determinism and stationarity. In particular, we first employ basic as well as advanced surrogate data tests to dismiss hypotheses relating the observed behavior to stochastic origin. Next, we apply two determinism tests, both attesting to the deterministic origin of the recorded eye movements. After positively establishing determinism, we check for violations of stationarity with an extensive nonlinear cross-prediction error analysis. Finally, we find that the maximal Lyapunov exponent associated with the gaze recordings is positive, thus allowing us to conjecture that the human eye movements show markers of deterministic chaos. We discuss the implications of our results for the previously established deterministic and stochastic models of eye movement control in reading.

Tarik Hadzibeganovic, Cognitive Neuroscience Research Unit, Dept. of Psychiatry and Forensic Medicine, School of Medicine, Universitat Autònoma de Barcelona, Hospital del Mar, Passeig Marítim 25, 08003 Barcelona, Spain
e–mail: ta.hadzibeganovic@uni-graz.at
http://www.edu.uni-graz.at/~hadzibeg

Matjaž Perc, Department of Physics, Faculty of Natural Sciences and Mathematics, University of Maribor, Koroška cesta 160, 2000 Maribor, Slovenia
e–mail: matjaz.perc@uni-mb.si
http://matjazperc.com/

Tuesday, 16:55–17:20

Parallelization and pivoting in one-sided Jacobi algorithms

Vjeran Hari, Saša Singer, Vedran Novaković and Sanja Singer

Abstract. Dopico, Koev and Molera have recently proposed the one-sided (trigonometric) Jacobi algorithm as a method of choice for accurate computation of eigenvalues and eigenvectors of Hermitian, possibly indefinite matrices.

Several blocked versions of this algorithm will be described, along with their advantages and pitfalls. A comparison will be made with similar blocked versions of the hyperbolic one-sided algorithm. These blockings are suitable for parallelization on distributed memory machines, and such parallel implementations, of both trigonometric and hyperbolic algorithms, will be presented in detail. If matrices permit, both types of algorithms compute eigenvalues and eigenvectors with high relative accuracy.

Finally, it will be shown how some simple modifications can make one-sided algorithms even faster. In addition, these modifications sort the eigenvalues as a side-effect.

Vjeran Hari, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: hari@math.hr
http://www.math.hr/~hari

Saša Singer, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: singer@math.hr
http://web.math.hr/~singer

Vedran Novaković, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, Ivana Lučića 5, 10000 Zagreb, Croatia
e–mail: venovako@fsb.hr
http://www.fsb.hr/~venovako

Sanja Singer, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, Ivana Lučića 5, 10000 Zagreb, Croatia
e–mail: ssinger@fsb.hr
http://www.fsb.hr/ssinger

THURSDAY, 18:05–18:30

Optimization of submarine pipeline laying

Stefan Ivić, Luka Sopta and Siniša Družeta

Abstract. Submarine pipeline laying process is designed on the basis of numerical structural analysis of pipeline during installation. The optimization of laying parameters was used to achieve optimal structural and technical conditions and to fulfill all imposed constraints during S-lay pipelaying. The optimization of continuous and discrete laying parameters is obtained with use of a highly specialized priority-based multi-objective and multi-constraint genetic algorithm. Employed optimization method includes integer chromosome encoding and special operators that are based on engineering experience in pipelaying. Software implementation of this optimization procedure is successfully applied on real offshore engineering projects.

STEFAN IVIĆ, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: `Stefan.Ivic@riteh.hr`

LUKA SOPTA, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: `Luka.Sopta@riteh.hr`

SINIŠA DRUŽETA, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: `Sinisa.Druzeta@riteh.hr`

Tuesday, 10:55–11:20

High order parametric polynomial approximation of conic sections

Gašper Jaklič, Jernej Kozak, Marjeta Krajnc, Vito Vitrih and Emil Žagar

Abstract. Conic sections, particularly circular arcs, are fundamental objects in computer aided geometric design. Although they can be exactly represented as rational parametric curves, they have no exact parametric polynomial representation (except for parabola, of course). Thus it is an interesting and important problem to look for good parametric polynomial approximants.

In this talk, a new class of parametric polynomials of degree $\leq n$ will be presented, which approximate the whole circle with the radial error of order $2n$. The approximants have some surprising properties and can be constructed by knowing the sines of particular fractions of π only. A similar result can be derived for ellipse and hyperbola. The results can be used for a high order polynomial approximation of a sphere and other surfaces of revolution.

Gašper Jaklič, FMF and IMFM, University of Ljubljana, Jadranska 19, 1000 Ljubljana, Slovenia
e–mail: gasper.jaklic@fmf.uni-lj.si
http://www.fmf.uni-lj.si/~jaklicg

Jernej Kozak, FMF and IMFM, University of Ljubljana, Jadranska 19, 1000 Ljubljana, Slovenia
e–mail: jernej.kozak@fmf.uni-lj.si
http://www.fmf.uni-lj.si/~kozak

Marjeta Krajnc, FMF and IMFM, University of Ljubljana, Jadranska 19, 1000 Ljubljana, Slovenia
e–mail: marjetka.krajnc@fmf.uni-lj.si
http://www.fmf.uni-lj.si/~krajncm

Vito Vitrih, PINT, University of Primorska, Muzejski trg 2, 6000 Koper, Slovenia
e–mail: vito.vitrih@upr.si
http://www.fmf.uni-lj.si/~vitrih

Emil Žagar, FMF and IMFM, University of Ljubljana, Jadranska 19, 1000 Ljubljana, Slovenia
e–mail: emil.zagar@fmf.uni-lj.si
http://valjhun.fmf.uni-lj.si/~emil

TUESDAY, 10:30–10:55

Minimizing curvature deviation by Hermite cubics

Gašper Jaklič and Emil Žagar

Abstract. There are several techniques known how to construct cubic Hermite interpolants. Many of them are based on particular minimization of important quantities (blending energy, e.g.). Sometimes the change in curvature is more important than its magnitude. In this talk, a particular measure of the change in curvature is considered in order to obtain satisfactory cubic Hermite interpolants. It turns out that, under suitable assumptions on given data, these interpolants reduce to parabolic geometric ones. As a consequence, they approximate regular convex curves with an asymptotic approximation order 4.

GAŠPER JAKLIČ, FMF and IMFM, University of Ljubljana, Jadranska 19, SI-1000 Ljubljana, Slovenia
e–mail: gasper.jaklic@fmf.uni-lj.si
http://www.fmf.uni-lj.si/~jaklicg

EMIL ŽAGAR, FMF and IMFM, University of Ljubljana, Jadranska 19, SI-1000 Ljubljana, Slovenia
e–mail: emil.zagar@fmf.uni-lj.si
http://valjhun.fmf.uni-lj.si/~emil

MONDAY, 17:40–18:05

On nonlinear weighted least squares fitting of the three-parameter inverse Weibull distribution

Dragan Jukić and Darija Marković

Abstract. In this paper we consider nonlinear least squares fitting of the three-parameter inverse Weibull distribution to the given data (w_i, t_i, y_i), $i = 1, \ldots, n$, $n \geq 3$. As the main result, we show that the best least squares estimate exists provided that the data satisfy just the following two natural conditions:

(i) $0 < t_1 < t_2 < \cdots < t_n$ and

(ii) $0 < y_1 < y_2 < \cdots < y_n < 1$.

To this end, an illustrative numerical example is given.

Dragan Jukić, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: jukicd@mathos.hr
http://www.mathos.hr/~jukicd

Darija Marković, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: darija@mathos.hr

Thursday, 11:40–12:05

The velocity averaging for a heat type equation

Martin Lazar and Darko Mitrović

Abstract. We prove that the sequence of averaged quantities

$$\int_{\mathbb{R}^m} h_n(t,x,\lambda)\rho(\lambda)\,d\lambda$$

is strongly precompact in $L^1_{loc}(\mathbb{R}^+\times\mathbb{R}^d)$, where $\rho\in C_0(\mathbb{R}^m)$, and $h_n\in L^2(\mathbb{R}^+\times\mathbb{R}^d\times\mathbb{R}^m)$ are solutions to heat type equations with flux explicitly depending on space variables.

The result is obtained by means of recently introduced parabolic H-measures.

Martin Lazar, University of Dubrovnik, Ćira Carića 4, 20000 Dubrovnik, Croatia
e–mail: mlazar@unidu.hr
http://www.unidu.hr/djelatnik/martin.lazar/cv.htm

Darko Mitrović, University of Montenegro, Faculty of Mathematics, Cetinjski put bb, 81000 Podgorica, Montenegro
e–mail: matematika@t-com.me

Monday, 12:05–12:30

Plate embedded in an elastic medium

Maroje Marohnić and Josip Tambača

Abstract. The objective of the work is to derive models of elastic plate embedded in an elastic medium starting from three-dimensional equations of linearized elasticity. We assume that the thickness of the plate is a small parameter and derive the models using asymptotic techniques. Contrary to the derivation of plate equations without elastic response from the medium, where only one scaling of loads/displacements is possible, we obtain different models depending on the order of scaling of the elastic medium. Justification of the order of scaling of applied loads is obtained by the formal asymptotic expansion. Then we prove that the solutions of the scaled three-dimensional problems converge to the solution of the plate equations via singular perturbation techniques.

Maroje Marohnić, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: maroje.marohnic@math.hr

Josip Tambača, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: tambaca@math.hr
http://web.math.hr/~tambaca

THURSDAY, 10:55–11:20

Least squares fitting the three-parameter inverse Weibull density

Miljenko Marušić, Darija Marković and Dragan Jukić

Abstract. The probability density function of the random variable T having a three-parameter inverse Weibull distribution with location parameter $\alpha \geq 0$, scale parameter $\eta > 0$ and shape parameter $\beta > 0$ is given by

$$f(t;\alpha,\beta,\eta) = \begin{cases} \frac{\beta}{\eta}\left(\frac{\eta}{t-\alpha}\right)^{\beta+1} e^{-\left(\frac{\eta}{t-\alpha}\right)^{\beta}}, & \text{for } t > \alpha, \\ 0, & \text{for } t \leq \alpha. \end{cases}$$

The inverse Weibull model was developed by Erto in 1982. In practice, the unknown parameters of the appropriate inverse Weibull density are not known and must be estimated from a random sample. Estimation of its parameters has been approached in the literature by various techniques, because a standard maximum likelihood estimate does not exist.

To estimate the unknown parameters of the three-parameter inverse Weibull density we will use a combination of nonparametric and parametric methods: in the first step we calculate an initial nonparametric density estimate which needs to be as good as possible, and in the second step we apply the nonlinear least squares method to initial density estimate in order to estimate the unknown parameters.

As a main result, a theorem on the existence of the least squares estimate is obtained, as well as its generalization in the l_p norm ($1 \leq p < \infty$). Numerical simulations illustrate our approach. We generated random data using three-parameter inverse Weibull distribution. For the nonparametric density estimate we used symmetric and adaptive kernel estimates. Simulations show that our approach is satisfactory if the initial density is of good enough quality.

MILJENKO MARUŠIĆ, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: miljenko.marusic@math.hr

DARIJA MARKOVIĆ, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: darija@mathos.hr

DRAGAN JUKIĆ, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: jukicd@mathos.hr
http://www.mathos.hr/~jukicd

Tuesday, 16:30–16:55

Accuracy of the Kogbetliantz method on scaled diagonally dominant triangular matrices

Josip Matejaš and Vjeran Hari

Abstract. The new results on the relative accuracy of the Kogbetliantz method for computing the singular value decomposition of triangular matrices are presented. First, it is shown how to modify the Voevodin formulas for the rotation angles in order to obtain an accurate SVD algorithm for triangular matrices of order two. Using a subtle rounding error analysis, the accuracy of the new algorithm is compared with that of the LAPACK routine xLASV2. The analysis uses natural assumptions which fully comply with the IEEE floating point standard. It expresses the final errors as functions of the errors of some initial or intermediate quantities. This enables to prove much sharper final error bounds, especially in the case when the initial matrix is nearly diagonal. Then these results are used in obtaining sharp relative accuracy estimates for one step of the Kogbetliantz method for triangular matrices of order n. The initial triangular matrix and the current iteration are assumed to be scaled diagonally dominant, where symmetric scaling is used. In the proof, a recent relative perturbation result for the singular values of such matrices is used. At the end several numerical tests are presented.

Josip Matejaš, Faculty of Economics, University of Zagreb, Kennedyjev trg 6, 10000 Zagreb, Croatia
e–mail: `josip.matejas@kr.htnet.hr`
http://www.efzg.hr/jmatejas

Vjeran Hari, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: `hari@math.hr`
http://www.math.hr/~hari

Monday, 11:40–12:05

Mathematical models and numerical methods for coupled nonlinear problems of dynamic thermoelasticity

Roderick Melnik and Linxiang Wang

Abstract. Initiated by the mathematical analysis of thermal stresses due to a thermal shock at the boundary in early 1950s, coupled dynamic thermoelasticity has been an important area of applied mathematics driven by challenges in the development of mathematical methods for coupled problems as well as by applications. While initially such application-driven problems relied mainly on linear models, over recent decades the class of nonlinear coupled dynamic problems of thermoelasticity has grown substantially.

In this contribution, we start from the general 3D model of dynamic nonlinear thermoelasticity, based on a coupled system of partial differential equations, which we apply for the description of shape memory alloys (SMA) dynamics and associated phase transformations. First, we apply center-manifold-based reduction procedures allowing to construct systematically new simplified models preserving essential features of the SMA dynamics. For some special cases, the reduction procedure can be carried out with the Proper Orthogonal Decomposition (POD) methodology and we demonstrate this on an example.

Then, our focus is on a mathematical model and its numerical discretization which we construct to analyze the wave propagation in shape memory alloy rods. The first order martensitic transformations and the associated effects of thermo-mechanical coupling are accounted for by employing the modified Ginzburg-Landau-Devonshire theory. The Landau-type free energy function characterizes different phases, while a Ginzburg term is introduced to account for the domain wall energy during phase transformations. From a mathematical point of view, the result is a system of coupled nonlinear time-dependent partial differential equations. The effect of internal friction on wave propagation patterns is analyzed under shock loadings implemented via stress boundary conditions. For practical numerical simulations of SMA samples, the constructed model of coupled nonlinear system of PDEs is reduced to a system of differential-algebraic equations, where the Chebyshev collocation method is employed for the spatial discretization, while the backward differentiation is used for the integration in time. A series of numerical experiments are carried out on copper-based SMA samples. Propagation of stress waves induced by shock loadings is analyzed for different initial temperature. It is demonstrated

that the patterns of wave propagation is complicated at low temperatures by phase transformations, while more regular patterns are observed for high temperature distributions. These observations are in agreement with experiments. Finally, the influence of viscosity effects(due to internal friction) on the overall thermo-mechanical behavior of rods is analyzed numerically.

In the reminder of this contribution, our main focus is on the development of a new model based on the Landau theory and on exploring its coupling with microstructural compatibility under the macroscopic continuum deformation framework. Computational methodologies based on finite volume and finite element implementations of the developed models will be discussed with examples.

Roderick Melnik, Department of Mathematics, Wilfrid Laurier University, 75 University Ave West, Waterloo, ON, N2L 3C5 Canada
e–mail: rmelnik@wlu.ca
http://www.m2netlab.wlu.ca

Linxiang Wang, MCI, University of Southern Denmark, Sonderborg, Denmark, and Hangzhou Dianzi University, Zhejiang, China
e–mail: lwang236@gmail.com

Monday, 10:55–11:20

Numerical analysis of a free piston problem

Boris Muha and Zvonimir Tutek

Abstract. The problem considered is the Stokes flow through a system of two pipes in gravity field; inside vertical pipe there is a free heavy piston. The theoretical analysis, existence and non-uniqueness of solution, has been completed recently by the authors. Here we present numerical analysis of the stationary state with respect to the angle between two pipes, diameters of the pipes and search for bifurcation points.

Boris Muha, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: borism@math.hr

Zvonimir Tutek, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: tutek@math.hr

Thursday, 16:05–16:30

The Cauchy problem for one-dimensional flow of a compressible viscous fluid: Stabilization of the solution

Nermina Mujaković and Ivan Dražić

Abstract. We consider the Cauchy problem for non-stationary 1-D flow of a compressible viscous and heat-conducting fluid, being in a thermodynamical sense perfect and polytropic. This problem has a unique generalized solution on $\mathbb{R}\times]0,T[$, for each $T>0$.

Assuming that the initial functions are small perturbations of the constants and using some estimates for the solution independent of T, we analyze the behavior of the solution as $T\to\infty$.

Nermina Mujaković, Department of Mathematics, University of Rijeka, Omladinska 14, 51000 Rijeka, Croatia
e–mail: mujakovic@inet.hr

Ivan Dražić, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: idrazic@riteh.hr

Tuesday, 18:05–18:30

Cardinal splines, Töplitz matrices and circulants

Vedran Novaković, Sanja Singer and Saša Singer

Abstract. We investigate behavior of the condition number of a linear system induced by the cardinal spline interpolation in the knot averages. Matrix of that linear system is symmetric and Töplitz one, and therefore can be embedded in a circulant matrix of higher order by periodization. We will show that such a circulant matrix is positive definite. It follows that, by the Cauchy interlace theorem, bounds for the condition of the corresponding Töplitz matrix can be obtained. Finally, we will present some numerical experiments which illustrate sharpness of these bounds.

Vedran Novaković, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, Ivana Lučića 5, 10000 Zagreb, Croatia
e–mail: `venovako@fsb.hr`
http://www.fsb.hr/~venovako

Sanja Singer, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, Ivana Lučića 5, 10000 Zagreb, Croatia
e–mail: `ssinger@fsb.hr`
http://www.fsb.hr/ssinger

Saša Singer, Department of Mathematics, University of Zagreb, Bijenička cesta 30, 10000 Zagreb, Croatia
e–mail: `singer@math.hr`
http://web.math.hr/~singer

Friday, 09:25–09:50

Sharp integral inequalities based on general four-point formulae via an extension of Montgomery identity

Josip Pečarić, Mihaela Ribičić Penava

Abstract. General weighted four-point quadrature formulae of the type

$$\int_a^b w(t)f(t)\,dt = \left(\frac{1}{2} - A(x)\right)[f(a)+f(b)] + A(x)[f(x)+f(a+b-x)] + R(f,w;x)$$

are considered using the extension of the weighted Montgomery identity. A number of inequalities which give error estimate for these weighted quadrature formulae for functions whose derivatives are from L_p-spaces, $1 \le p \le \infty$, are proved. These inequalities are generally sharp (in case $p=1$ the best possible).

As special case, Simpson's 3/8 formula and Lobatto four-point formula with related inequalities are considered.

Josip Pečarić, Faculty of Textile Technology, University of Zagreb, Pierottijeva 6, 10000 Zagreb, Croatia
e–mail: pecaric@hazu.hr

Mihaela Ribičić Penava, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: mihaela@mathos.hr

Friday, 10:35–11:00

Mathematical model of a coal-fired thermal power plant

Adrijana Radošević, Jerko Škifić and Luka Sopta

Abstract. A coal-fired thermal power plant is a complex technical system consisting of many elements. Due to the complexity of the system and a large number of variables, a modular approach to the mathematical modeling was used. The essential power plant subsystems and their elements have been identified and their mathematical models included into the global mathematical model of the power

plant. The operating parameters of the power plant are obtained through hierarchical subsystem-wise modeling. The model has been implemented in a software application for coal-fired thermal power plant simulation. The software is a powerful tool for power plant performance and efficiency analysis, as well as power plant design.

Adrijana Radošević, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: Adrijana.Radosevic@gmail.com

Jerko Škifić, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: Jerko.Skific@riteh.hr

Luka Sopta, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: Luka.Sopta@riteh.hr

Monday, 16:05–16:30

Asymptotics for a class of Ginzburg-Landau functionals with oscillating penalizing term in one dimension

Andrija Raguž

Abstract. In this paper we study asymptotic behavior as $\varepsilon \to 0$ of Ginzburg-Landau functional

$$I^{\varepsilon}_{a,g}(v) := \int_0^1 \Big(\varepsilon^2 v''^2(s) + W(v'(s)) + a(s)(v(s) + \varepsilon^{\gamma} g(\varepsilon^{-\gamma} s))^2\Big)\, ds,$$

where $v \in \mathrm{H}^2_{per}(0,1)$, $\gamma > 0$, W is a non-negative continuous function vanishing only at 1 and -1, $a \in \mathrm{L}^1_{per}(0,1)$, $a(s) \geq \alpha > 0$ (a.e. $s \in (0,1)$) and $g \in \mathrm{W}^{1,\infty}_{per}(0,1)$ is 1-Lipschitz. By using he approach of G. Alberti and S. Müller (CPAM 2001) we calculate rescaled asymptotic energy associated to $I^{\varepsilon}_{a,g}$ as $\varepsilon \to 0$ in terms of a, W, g and γ.

Andrija Raguž, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: andrija@math.hr
http://www.math.hr/~andrija

THURSDAY, 10:05–10:30

Searching for a best LAD-solution of an overdetermined system of linear equations motivated by searching for a best LAD-hyperplane on the basis of given data

Kristian Sabo, Rudolf Scitovski and Ivan Vazler

Abstract. We consider the problem of searching for a best LAD-solution of an overdetermined system of linear equations $Xa = y$, $X \in \mathbb{R}^{m\times n}$, $a \in \mathbb{R}^n, y \in \mathbb{R}^m$, $m \geq n$. This problem is equivalent to the problem of determining a best LAD-hyperplane $x \mapsto a^T x$, $x \in \mathbb{R}^n$ on the basis of given data $(x^{(i)}, y_i)$, $i = 1, \dots, m$, whereby the minimizing functional is of the form

$$F(a) = \|y - Xa\|_1 = \sum_{i=1}^{m} |y_i - a^T x^{(i)}|.$$

An iterative procedure is constructed as a sequence of weighted median problems, which gives the solution in finitely many steps. Criterion of optimality follows from the fact that the minimizing functional F is convex, and therefore the point $a^* \in \mathbb{R}^n$ is the point of global minimum of the functional F if and only if $0 \in \partial F(a^*)$.

Motivation for the construction of the algorithm was found in a geometrically visible algorithm for determining a best LAD-plane $(x, y) \mapsto \alpha x + \beta y$, passing through the origin of the coordinate system, on the basis of the data (x_i, y_i, z_i), $i = 1, \dots, m$.

KRISTIAN SABO, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: ksabo@mathos.hr
http://www.mathos.hr/~ksabo

RUDOLF SCITOVSKI, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: scitowsk@mathos.hr
http://www.mathos.hr/~scitowsk

IVAN VAZLER, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: ivazler@mathos.hr
http://www.mathos.hr/~ivazler

Friday, 11:25–11:50

Numerical analysis of the Caughley model from ecology

Sergey Shindin, Naben Parumasur

Abstract. Consider the following system of reaction-diffusion equations

$$u_t = \mathcal{L}u + f(u), \quad u \in (C^{(1)}(\mathbb{R}_+), H^1(\mathbb{R}^n)), \quad u(x,0) = u_0(x), \tag{1}$$

where $u = (u^1, \dots, u^m)$, $f : \mathbb{R}^m \to \mathbb{R}^m$, $\mathcal{L} = \mathrm{diag}(d_1\triangle, \dots, d_m\triangle)$, $\triangle$ is the Laplacian, and $d_i \in \mathbb{R}_+$. Equations (1) arise naturally in many applications, typical examples are models from mathematical ecology, where the vector u represents the densities of m interacting species, the nonlinearity f provides the functional response, and the operator $\mathcal{L}$ describes the spatial distribution of the species. The major difficulty in the numerical simulation of (1) comes from the *unboundedness* of the spatial domain. Majority of discretization schemes for PDEs are tailored to deal with bounded domains *only*. The standard way out in this situation is to replace the original system (1) posed on the infinite domain by an equivalent one posed on a bounded domain. The reduction strategy may strongly depend on the aims of numerical simulation and on the physical nature of the phenomena under investigation. For example, if the aim is to study solutions of (1) on some bounded subdomain $\Omega \subset \mathbb{R}^n$, then a natural approach is to introduce some artificial (or transparent) boundary conditions (ABC or TBC) on $\partial\Omega$. This technique works well for *linear* equations when the initial data is compactly supported in the interior of Ω. When the asymptotical behaviour of the solution is known *apriori*, the ABC method could be extended to *nonlinear* equations as well. Another possible approach is based on the fast evaluation of the heat potential. The method was specifically designed to deal with *linear* equations. Numerical experiments confirm good performance if the dimension n is not too big. The aim of the present paper is different. Here we want to study numerically the long time behaviour of the solutions in terms of a global attractor. As a consequence of this and the nonlinearity f we have to approximate solutions in the whole space $\mathbb{R}^n$. Hence, we cannot use techniques based on the truncation of the domain. The only option we have is to map $\mathbb{R}^n$ onto the bounded domain and then solve the resulting problem numerically.

Sergey Shindin, University of KwaZulu-Natal, School of Mathematical Sciences, Private Bag X54001, Durban, 4000, South Africa
e–mail: `shindins@ukzn.ac.za`

Naben Parumasur, University of KwaZulu-Natal, School of Mathematical Sciences, Private Bag X54001, Durban, 4000, South Africa
e–mail: `parumasurn1@ukzn.ac.za`

Tuesday, 17:40–18:05

Fast and accurate computation of Gaussian quadrature for tension powers

Saša Singer and Dirk Laurie

Abstract. In several applications we need to compute the Gaussian quadrature formula of order n that exactly integrates a system of tension powers

$$1, x, x^2, \dots, x^{2n-3}, \sinh(px), \cosh(px),$$

on given interval $[a, b]$, where $p > 0$ is a given tension parameter. Since p can assume many different values within the same application, it is not possible to precalculate all the required quadrature formulæ. Instead, we need an efficient "on-demand" algorithm, that calculates the nodes and weights for a given value of p, at least for reasonably low values of n (say, $n \leq 20$). Moreover, full machine accuracy of computed results is required in all cases.

These formulæ are quite hard to compute to high relative precision, especially for small values of p. The truncated Legendre expansion of $\cosh(px)$ can be efficiently computed to deal with this case. The method itself is based on numerical solution of the defining exact integration equations. In an earlier version, the whole nonlinear system of n equations was solved, with computational complexity of order $O(n^3)$. Now we have a new algorithm that requires only $O(n^2)$ operations. It is based on the Golub–Welsh procedure for standard Gaussian quadrature, and the Brent–Dekker algorithm is used to solve a single nonlinear equation.

We shall present an outline of the new algorithm, followed by a detailed description of several key steps, with emphasis on numerical stability. The accuracy of this approach will be illustrated by a few numerical examples. Finally, we shall discuss some possible improvements of the algorithm.

Saša Singer, Department of Mathematics, University of Zagreb, P.O. Box 335, 10002 Zagreb, Croatia
e–mail: `singer@math.hr`
http://web.math.hr/~singer

Dirk Laurie, Department of Mathematical Sciences, University of Stellenbosch, Stellenbosch, South Africa
e–mail: `dlaurie@na-net.ornl.gov`
http://dip.sun.ac.za/~laurie

THURSDAY, 16:55–17:20

Lower dimensional models in micropolar elasticity

Josip Tambača and Igor Velčić

Abstract. Starting from nonlinear three-dimensional micropolar elasticity we derive and justify, by means of Γ-convergence, the lower dimensional models.

JOSIP TAMBAČA, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: tambaca@math.hr

IGOR VELČIĆ, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: ivelcic@math.hr

MONDAY, 18:05–18:30

On overdamped systems

Krešimir Veselić

Abstract. We bring some results on spectra of overdamped second order systems. One of them is an analog of the known Cauchy interlacing property. Another concerns stability of overdampedness property.

KREŠIMIR VESELIĆ, LG Mathematische Physik, Fernuniversität Hagen, P.O. Box 940, D-58084 Hagen, Germany
e–mail: kresimir.veselic@fernuni-hagen.de
http://www.fernuni-hagen.de/MATHPHYS/veselic/

THURSDAY, 10:30–10:55

Lattices on simplicial partitions with holes

Vito Vitrih

Abstract. It is well known that the existence and the uniqueness of the Lagrange interpolant in Π_n^d, $(d > 1)$, the space of polynomials in d variables of total degree $\leq n$, heavily depends on the geometry of the interpolation points. This fact makes interpolation in several variables much more complicated than the univariate one. Although a simple algebraic characterization states that a set of interpolation points is correct in Π_n^d if and only if they do not lie on an algebraic hypersurface of degree $\leq n$, it is useless in practical computations, since in general it can not be verified in the floating point arithmetic. Thus a considerable research has been focused on finding configurations of points which guarantee the existence and the uniqueness of the Lagrange interpolant. Perhaps the most frequently used configurations of this type are lattices which satisfy the well-known GC (geometric characterization) condition. Among them, principal lattices and their generalization, $(d+1)$-pencil lattices, are the most important.

In this talk, $(d+1)$-pencil lattices on simplicial partitions in $\mathbb{R}^d$ will be considered. The barycentric representation of the lattice enables us to extend the lattice from a simplex to a simplicial partition in such a way, that at least continuity over common faces of simplices is ensured. The number of free shape parameters will be considered for simplicial partitions with (or without) holes. It will be shown, how the lattice can be extended in order to fill the holes. Some important applications of lattices will be presented, too.

VITO VITRIH, PINT, University of Primorska, Muzejski trg 2, 6000 Koper, Slovenia
e–mail: vito.vitrih@upr.si
http://www.fmf.uni-lj.si/~vitrih

Monday, 16:55–17:20

Relaxation of inverse problems by homogenisation method

Marko Vrdoljak

Abstract. We study the inverse problem of identifying the arrangement of two given isotropic materials such that the measurements at the boundary, or at the final time for evolution problems, are achieved. The proposed approach can be used for stationary diffusion equation, as well as for the wave or the heat equation, but with coefficients depending only on space variables.

We interpret the inverse problem as an optimal design problem and use the homogenisation method as the relaxation tool, which enables us to use standard variational techniques for obtaining necessary conditions of optimality. These conditions are used as the basis for the optimality criteria method, which is the most used numerical method for optimal design problems. The update of design parameters in this iterative method is based on the recent results on multiple state optimal design problems.

Marko Vrdoljak, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: marko@math.hr

LIST OF PARTICIPANTS

IBRAHIM AGANOVIĆ, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: aga@math.hr

NENAD ANTONIĆ, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: nenad@anak.math.hr
http://www.math.hr/~nenad

TINA BOSNER, Department of Mathematics, University of Zagreb, P.O. Box 335, 10002 Zagreb, Croatia
e–mail: tinab@math.hr
http://www.math.hr/~tinab

DIDIER BRESCH, Université de Savoie UFR SFA, Campus Scientifique, 73376 Le Bourget-du-Lac Cedex, France
e–mail: Didier.Bresch@univ-savoie.fr

ALAIN BOURGEAT, Université de Lyon, Université Lyon 1, CNRS UMR 5208 Institut Camille Jordan 69200 Villeurbanne, France
e–mail: bourgeat@mcs.univ-lyon1.fr
http://math.univ-lyon1.fr/~bourgeat/

KREŠIMIR BURAZIN, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: kburazin@mathos.hr

PATRICK CHENIN, Laboratoire Jean Kuntzman, Université Joseph Fourier, BP 53 F-38051 Grenoble Cedex 9, France
e–mail: Patrick.Chenin@imag.fr

BOJAN CRNKOVIĆ, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: Bojan.Crnkovic@riteh.hr

AMBROZ ČIVLJAK, American College of Management and Technology, Rochester Institute of Technology, Don Frana Bulića 6, 20000 Dubrovnik, Croatia
e–mail: acivljak@acmt.hr

NELIDA ČRNJARIĆ ŽIC, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: Nelida.Crnjaric@riteh.hr

IVAN DRAŽIĆ, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: idrazic@riteh.hr

ZLATKO DRMAČ, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: drmac@math.hr
http://www.math.hr/~drmac

LISELOTT FLODÉN, Mid Sweden University, Department of Engineering and Sustainable Development, S-83125 Östersund, Sweden
e–mail: lotta.floden@miun.se

TOMISLAV FRATROVIĆ, Faculty of Traffic and Transport Sciences, University of Zagreb, ZUK Borongaj, Borongajska cesta 83A, pp. 170, Zagreb, Croatia
e–mail: tomislav.fratrovic@fpz.hr
http://www.fpz.hr/~tfratrov

MOSHE GOLDBERG, Department of Mathematics, Technion–Institute of Technology, Haifa 32000, Israel
e–mail: goldberg@math.technion.ac.il

FIKRET GÖLGELEYEN, Zonguldak Karaelmas University, Incivez, 67100 Zonguldak, Turkey
e–mail: golgeleyen@yahoo.com

TARIK HADZIBEGANOVIC, Cognitive Neuroscience Research Unit, Dept. of Psychiatry and Forensic Medicine, School of Medicine, Universitat Autònoma de Barcelona, Hospital del Mar, Passeig Marítim 25, 08003 Barcelona, Spain
e–mail: ta.hadzibeganovic@uni-graz.at
http://www.edu.uni-graz.at/~hadzibeg

VJERAN HARI, Department of Mathematics, University of Zagreb, Bijenička cesta 30, 10000 Zagreb, Croatia
e–mail: hari@math.hr
http://www.math.hr/~hari

ANDERS HOLMBOM, Mid Sweden University, Department of Engineering and Sustainable Development, S-83125 Östersund, Sweden
e–mail: anders.holmbom@miun.se

STEFAN IVIĆ, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: Stefan.Ivic@riteh.hr

Gašper Jaklič, FMF and IMFM, University of Ljubljana, Jadranska 19, SI-1000 Ljubljana, Slovenia
e–mail: gasper.jaklic@fmf.uni-lj.si
http://www.fmf.uni-lj.si/~jaklicg

Dragan Jukić, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: jukicd@mathos.hr
http://www.mathos.hr/~jukicd

Mladen Jurak, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: jurak@math.hr
http://www.math.hr/~jurak

Iva Kavčič, Department of Geophysics, Faculty of Science, University of Zagreb, University of Zagreb, Horvatovac bb, 10000 Zagreb, Croatia
e–mail: ivakavc@gfz.hr

Marjeta Krajnc, FMF and IMFM, University of Ljubljana, Jadranska 19, 1000 Ljubljana, Slovenia
e–mail: marjetka.krajnc@fmf.uni-lj.si
http://www.fmf.uni-lj.si/~krajncm

Martin Lazar, University of Dubrovnik, Ćira Carića 4, 20000 Dubrovnik, Croatia
e–mail: mlazar@unidu.hr
http://www.unidu.hr/djelatnik/martin.lazar/cv.htm

Tom Lyche, CMA and Department of Informatics, University of Oslo, P.O. Box 1053, Blindern, 0316 Oslo, Norway
e–mail: tom@ifi.uio.no
http://home.ifi.uio.no/tom/

Martina Manhart, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: martina.barberic@math.hr

Carla Manni, Department of Mathematics, Università di Roma “Tor Vergata”, Via della Ricerca Scientifica 00133 Roma, Italy
e–mail: manni@mat.uniroma2.it
http://www.mat.uniroma2.it/~manni/home_inglese.html

Darija Marković, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: darija@mathos.hr

Maroje Marohnić, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: maroje.marohnic@math.hr

Miljenko Marušić, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: miljenko.marusic@math.hr

Eduard Marušić–Paloka, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: emarusic@math.hr

Josip Matejaš, Faculty of Economics, University of Zagreb, Kennedyjev trg 6, 10000 Zagreb, Croatia
e–mail: josip.matejas@kr.htnet.hr
http://www.efzg.hr/jmatejas

Roderick Melnik, Department of Mathematics, Wilfrid Laurier University, 75 University Ave West, Waterloo, ON, N2L 3C5 Canada
e–mail: rmelnik@wlu.ca
http://www.m2netlab.wlu.ca

John J. H. Miller, Institute for Numerical Computation and Analysis, Dublin, Ireland
e–mail: jm@incaireland.org

Boris Muha, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: borism@math.hr

Nermina Mujaković, Department of Mathematics, University of Rijeka, Omladinska 14, 51000 Rijeka, Croatia
e–mail: mujakovic@inet.hr

Vedran Novaković, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, Ivana Lučića 5, 10000 Zagreb, Croatia
e–mail: venovako@fsb.hr
http://www.fsb.hr/~venovako

Marianne Olsson, Mid Sweden University, Department of Engineering and Sustainable Development, S-83125 Östersund, Sweden
e–mail: marianne.olsson@miun.se

Alma Omerspahić, Mechanical Engineering Faculty, University of Sarajevo, Vilsonovo šetaliste 9, 71000 Sarajevo, Bosnia and Herzegovina
e–mail: alma.omerspahic@mef.unsa.ba

Igor Pažanin, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: pazanin@math.hr
http://web.math.hr/~pazanin

Adrijana Radošević, Faculty of Engineering, University of Rijeka, Vukovarska 58, 51000 Rijeka, Croatia
e–mail: Adrijana.Radosevic@gmail.com

Andrija Raguž, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: andrija@math.hr
http://www.math.hr/~andrija

Mihaela Ribičić Penava, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: mihaela@mathos.hr

Mladen Rogina, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: rogina@math.hr
http://www.math.hr/~rogina

Kristian Sabo, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: ksabo@mathos.hr
http://www.mathos.hr/~ksabo

Rudolf Scitovski, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: scitowsk@mathos.hr
http://www.mathos.hr/~scitowsk

SANJA SINGER, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, Ivana Lučića 5, 10000 Zagreb, Croatia
e–mail: ssinger@fsb.hr
http://www.fsb.hr/ssinger

SAŠA SINGER, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: singer@math.hr
http://web.math.hr/~singer

JOSIP TAMBAČA, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: tambaca@math.hr
http://web.math.hr/~tambaca

ZVONIMIR TUTEK, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: tutek@math.hr

ZEKERIYA USTAOĞLU, Zonguldak Karaelmas University, Incivez, 67100 Zonguldak, Turkey
e–mail: zekeriyaustaoglu@karaelmas.edu.tr

IVAN VAZLER, Department of Mathematics, University of Osijek, Trg Ljudevita Gaja 6, 31000 Osijek, Croatia
e–mail: ivazler@mathos.hr
http://www.mathos.hr/~ivazler

IGOR VELČIĆ, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: ivelcic@math.hr

KREŠIMIR VESELIĆ, LG Mathematische Physik, Fernuniversität Hagen, P.O. Box 940, D-58084 Hagen, Germany
e–mail: kresimir.veselic@fernuni-hagen.de
http://www.fernuni-hagen.de/MATHPHYS/veselic/

VITO VITRIH, PINT, University of Primorska, Muzejski trg 2, 6000 Koper, Slovenia
e–mail: vito.vitrih@upr.si
http://www.fmf.uni-lj.si/~vitrih

ANJA VRBAŠKI, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: avrbaski@math.hr

Marko Vrdoljak, Department of Mathematics, University of Zagreb, Bijenička 30, 10000 Zagreb, Croatia
e–mail: marko@math.hr

Alexander Zuevsky, National University of Ireland, Galway
e–mail: sashacar@yahoo.com

Ana Žgaljić Keko, Faculty of Electrical Engineering and Computing, University of Zagreb, Unska 3, 10000 Zagreb, Croatia
e–mail: ana.zgaljic@fer.hr