

SNA'23 Programme

<http://www.ugn.cas.cz/link/sna23>

SEMINAR ON NUMERICAL ANALYSIS

Modelling and Simulation of Challenging Engineering Problems

WINTER SCHOOL

*Methods of Numerical Mathematics and Modelling,
High-Performance Computing, Numerical Linear Algebra*

Monday - January 23, 2023 venue: **FEI VŠB-TUO / EC1**

11:00 – 13:50 Registration – FEI VŠB-TUO

12:00 – 13:50 Lunch - Menza VŠB-TUO

13:50 – 14:30 **Conference opening**

S. Sysala: SNA 2003 – 2023 and selected memories of Professor Radim Blaheta

D. Lukáš: Professor Radim Blaheta – The Teacher

14:30 – 16:00 Winter school - chair J. Kruis

Z. Strakoš: Numerical approximation of the spectrum of self-adjoint operators, operator preconditioning and an unfinished talk with Radim Blaheta

Coffee break

16:30 – 18:30 Lectures - chair M. Rozložník

M. Neytcheva: On preconditioning of some fully implicit Runge-Kutta methods

S. Margenov: Optimal preconditioning methods and algorithms

P. Arbenz: Some consideration on the use of spectral projectors for large scale eigenvalue computations

J. Mandel: Building a fuel moisture model for the coupled fire-atmosphere model WRF-SFIRE from data: From Kalman filters to recurrent neural networks (*on-line*)

T. Kozubek: Radim Blaheta and IT4Innovations

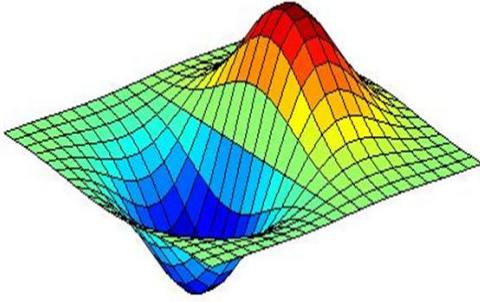
M. Rozložník: How Radim Blaheta influenced us

19:00 – 22:00 *Welcome dinner – Menza VŠB-TUO*

Conference venues:

FEI VŠB-TUO Faculty of Electrical Engineering and Computer Science, Technical University of Ostrava

ÚGN AVČR Institute of Geonics, Czech Academy of Sciences, Ostrava



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Tuesday - January 24, 2023 venue: **FEI VŠB-TUO / EC1**

9:00 – 10:30 Winter school - chair I. Pultarová

M. Ladecký: Discrete Green's operator preconditioning: Theory and applications

Coffee break

11:00 – 12:40 Lectures - chair P. Arbenz

J. Šístek: Domain decomposition solver for immersed boundary finite element method

R. Cimrman: Direct construction of reciprocal mass matrix and higher order finite element method

M. Isoz: Development, validation, and application of a solver for non-isothermal non-adiabatic packed bed reactors

T. Koudelka: Effect of parallelization on the calculation of internal forces for nonlinear material models

T. Ligurský: On thermodynamically consistent coupling of the Barcelona Basic Model with a hydraulic model for unsaturated soils

12:40 – 14:00 Lunch - Menza VŠB-TUO

14:00 – 16:00 Lectures - chair M. Neytcheva

I. Pultarová: Guaranteed lower bounds to effective PDE parameters

J. Kruis: Multi-time step methods for lattice discrete particle models

D. Horák: New variant of the SMALSE algorithm

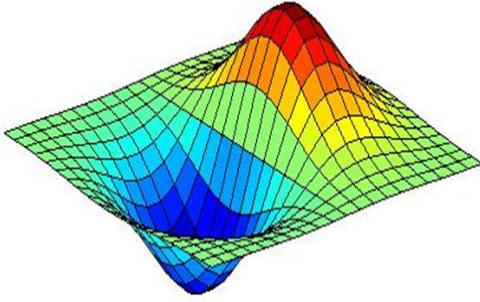
Y. Saad: Nonlinear acceleration, inexact Newton, and nonlinear generalized conjugate residual approaches (*on-line*)

B. Sousedík: Inexact and primal multilevel FETI-DP methods (*on-line*)

Coffee break

16:30 – 18:00 Winter school - chair D. Lukáš

M. Běreš: Solution of PDEs with uncertainties in parameters by the stochastic Galerkin method with geotechnical applications



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Wednesday - January 25, 2023 venue: **FEI VŠB-TUO / EC1**

9:00 – 10:30 Winter school - chair P. Tichý

S. Pozza: Matrix decay phenomenon and its applications I

Coffee break

11:00 – 12:40 Lectures - chair Z. Strakoš

J. Karátson: Quasi-Newton iterative methods for some elliptic PDEs with power order nonlinearities

P. Tichý: Behaviour of the Gauss-Radau upper bound

T. Vejchodský: Guaranteed L2 error bounds for finite element approximations of Laplace eigenfunctions

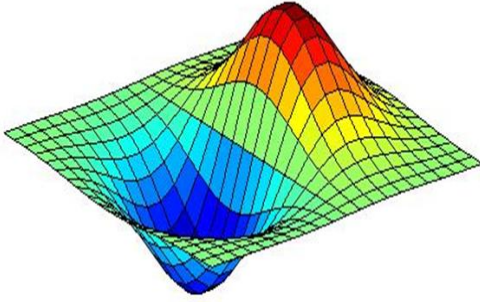
J. Papež: Remarks on the paper Adaptive error control for multigrid finite element methods

N. Van Buggenhout: ★-procedure to solve non-autonomous ODEs

12:40 – 13:40 Lunch - Menza VŠB-TUO

13:45 – 18:00 Excursion – Job Air Technic company in Mošnov

18:30 Dinner – Radegastovna Aura



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Thursday - January 26, 2023 venue: **FEI VŠB-TUO / EC1**

9:00 – 10:30 Winter school - chair I. Hnětynková

S. Pozza: Matrix decay phenomenon and its applications II

Coffee break

11:00 – 12:30 Winter school - chair J. Březina

J. Stebel: Poroelasticity: Mathematical modelling, numerical solution and applications

12:30 – 14:00 Lunch - Menza VŠB-TUO

14:00 – 16:00 Lectures - chair J. Šístek

D. Janovská: A note on Clifford algebras

J. Machalová: Post-buckling solution for nonlinear beam developed by D.Y. Gao

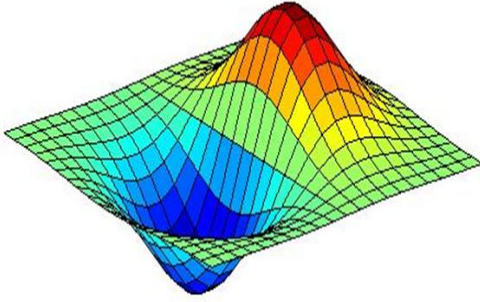
V. Kučera: Low-Mach consistency of a class of linearly implicit schemes for the compressible Euler equations

J. Egermaier: Block preconditioning with approximate inner solvers for incompressible flow problems based on IgA discretization

J. Duintjer Tebbens: On an ODE decomposition for biochemical networks due to Erich Bohl and Ivo Marek and its usage for preconditioning in PDE's

L. Vacek: L^2 stability of macroscopic traffic flow models on networks using numerical fluxes at junctions

Coffee break



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Thursday - January 26, 2023 venue: **FEI VŠB-TUO / EC1**

16:30 – 17:30 Lectures - chair V. Kučera

J. Chleboun: Ratcheting and the propagation of uncertainty in a hypoplasticity model

J. Březina: Multilevel Monte Carlo contaminant transport in service of the safety assessment of deep geological repository

J. Malík: Determination of the initial stress by analysis of convergences on the tunnel walls

E. Havelková: Quality assessment of volume reconstructions in Single Particle Analysis

17:30 – 18:00 Presentations to posters

18:30 – 19:30 **Poster session** venue: **ÚGN AVČR**

J. Burkotová: Interactive multiobjective optimization of hydraulic pump design

I. Hnětynková: Recent development of the core problem theory in the context of the Total Least Squares Minimization

J. Hozman: Numerical valuation of the investment project flexibility: a comparison of European, Bermudan and American option styles

D. Hrbáč: Node renumbering strategies for efficient direct methods in selected problems of soil mechanics

T. Krejčí: Coupled thermo-hydro-mechanical modeling of bentonite in engineered barrier of nuclear waste repository

T. Luber: Comparison of preconditioners for poroelasticity

C. Matonoha, Š. Papáček: Computational costs related to Bohl-Marek decomposition applied to a class of biochemical networks

K. Miranda: Simulation of solids and binary fluid interface interactions considering wetting effects

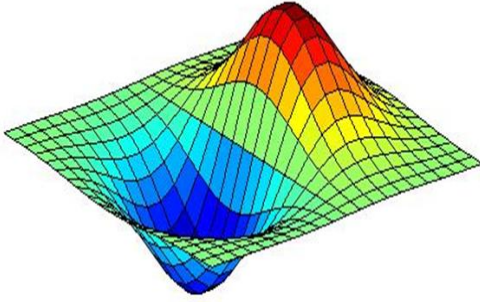
M. Šarmanová: Preconditioning in solution of electron-molecule scattering problems

D. Šimonová: The block Lanczos algorithm

J. Valášek: Comparison of different approaches to determination of resonant frequencies of coupled vibro-acoustic systems

R. Varga: Discrete element method for the analysis of concrete structures

19:30 – 23:00 *Conference dinner – ÚGN AVČR*



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Friday - January 27, 2023 venue: **ÚGN AVČR**

10:00 – 12:00 Lectures - chair D. Horák

L. Kubíčková: Implementation of wall functions into a hybrid fictitious domain-immersed boundary method

O. Studeník: Improving computational efficiency of contact solution in fully resolved CFD-DEM simulations with arbitrarily-shaped solids

A. Kovárnová: Model order reduction of transport-dominated systems using shifted proper orthogonal decomposition and artificial neural networks

M. Bailová: A new approach to solving quasilinear boundary value problems with p -Laplacian using optimization

V. Arzt: On solution of shape optimization for Stokes problem with stick-slip condition

Conference closing

12:00 – 14:00 *Lunch - Menza VŠB-TUO*