SNA’23 Programme
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SEMESTER 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
Tuesday - January 24, 2023

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. Béreš: Solution of PDEs with uncertainties in parameters by the stochastic Galerkin method with geotechnical applications
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-TU0

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

18:30  **Dinner – Radegastovna Aura**
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-TU0

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. Malik: 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-hygro-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. Kubičková: 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-TU0