ALGORITMY

Conference on Scientific Computing

10-15 September, 2020

Programme

Thursday, September 10th

15.00-20.00   Registration of On-site participants

15.00 -   Check-in

18.00–21.00   Dinner

Friday, September 11th

07.00–08.45   Breakfast

08.50–09.00   Opening of the conference (Congress Hall, 8th floor)

09.00-10.40 Plenary lectures (Congress hall, 8th floor) – *chairman Karol Mikula*

09.00–09.50   D. Kuzmin: Bound-preserving discretizations of conservation laws using high-order finite elements

09.50–10.40   J. Droniou (Online): High-order methods for linear and non-linear elliptic equations

10.40–11.10   Coffee break

11.10–12.10   Parallel sessions

Session A (Congress Hall, 8th floor) – session on Innovative models and algorithms for inverse problems in imaging and image processing – *chairman Jooyoung Hahn*

11.10–11.40   M. Kollár et al.: NaturaSat – software for segmentation of Natura 2000 habitats from Sentinel-2 satellite images

11.40–12.10   S. Ah Park et al.: Segmentation and tracking of macrophages in 2D+time microscopy images

Session B (Blue Hall, 7th floor) – session on Numerical simulation of multiphase flow, transport and phase transitions – *chairman Dmitri Kuzmin*

11.10–11.40   V. Fuka: LES simulation and tracking of very large structures over rough surfaces

11.40–12.10   P. Knobloch: On the solvability of the nonlinear problems in an algebraically stabilized finite element method for evolutionary transport-dominated equations

12.10–14.00   Lunch

14.00–16.20   Parallel sessions

Session A (Congress Hall, 8th floor) – contributed session on Biology and medical image processing and cell modelling – *chairman Elfriede Friedmann*

14.00–14.20   M. Olunna Uba et al.: Segmentation of cell microscopy images in developmental biology

14.20–14.40   B. Kósa et al.: Image segmentation and point cloud surface reconstruction by level set methods

14.40–15.00   I. Cimrák: Modelling of cells with inner structures

15.00–15.20   A. Bohiniková: Computational models of cells with nucleus

15.20–15.40   O. Stašová: Regularised coherence enhancing diffusion

15.40–16.00   P. Omondi Okock et al.: Efficient 3D shape registration in medical image processing

16.00–16.20   K. Kovalčíková: Obstacle Design in ESPResSo

Session B (<u>Blue Hall, 7th floor</u>) – contributed session on Numerical linear algebra and ODEs with applications – *chairman Jiří Vala*

14.00–14.20   M. Tůma: Null-space approach for solving least squares with constraints

14.20–14.40   M. Rozložník: Near optimal scalings in the SR decomposition

14.40–15.00   P. Tichý: The multiplicative Schwarz method for matrices with a special block structure

15.00–15.20   J. Papež: From a posteriori algebraic error estimator to multilevel iterative solvers with p-robust behavior

15.20–15.40   J. Šístek: Towards a parallel domain decomposition solver for immersed boundary finite element method

15.40–16.00   J. Kopfová et al.: Long term analysis of non-pharmaceutical interventions in SIR model

16.00–16.20   T. Schneidereit, Michael Breuss: Solving ordinary differential equations using artificial neural networks - a study on the solution variance

16.20–17.00   Coffee break

17.00–18.40   Plenary lectures (<u>Congress hall, 8th floor</u>) – *chairman Daniel Ševčovič*

17.00–17.50   E. Haber (Online): Machine learning meets optimal control and PDEs inspired neural networks

17.50–18.40   C. Vazquez Cendon (Online): Computational advances in financial mathematics

19.00–21.00   Dinner

Saturday, September 12th

07.00–08.55   Breakfast

09.00-10.40 Plenary lectures (Congress hall, 8th floor) – chairman Martin Gander

09.00–09.50   Jooyoung Hahn: Finite volume level set methods in combustion engines

09.50–10.40   Xue-Cheng Tai (Online): Deep neural networks in image processing

10.40–11.10   Coffee break

11.10–12.10   Parallel sessions

Session A (Congress Hall, 8th floor) – session on Combustion in gas and other materials and flame propagation – *chairman Ivan Cimrák*

11.10–11.40   Martin Ambroz et al.: Forest fire propagation numerical model and its parameters estimation

11.40–12.10   Robert Straka: Application of Lattice Boltzmann method in combustion

Session B (Blue Hall, 7th floor) – session on High-order numerics for multiscale time-dependent problems – *chairman Václav Kučera*

11.10–11.40   Hennes Hajduk: Discrete maximum principle preserving methods for hyperbolic systems

11.40–12.10   Andreas Rupp: Simulating structure formation in soils across scales using discontinuous Galerkin methods

Session C (Conference room, 12th floor) – session on Iterative methods with applications - fast, robust and parallelizable solvers (Online) – *chairman Radim Blaheta*

11.10–11.40   Owe Axelsson: Regularization methods for the construction of preconditioners for saddle point problems

11.40–12.10   Maya Neytcheva, Owe Axelsson: Numerical solution methods for implicit Runge-Kutta methods of arbitrary high order

12.10–14.00   Lunch

14.00–16.00 Parallel sessions

Session A (Congress Hall, 8th floor) – session on Numerical simulations of fluid flows – *chairman Miloslav Feistauer*

14.00–14.30   Miloslav Feistauer et al.: Discontinuous Galerkin method for the fluid-structure interaction

14.30–15.00   Petr Sváček: On finite element approximation of incompressible fluid flow in computational domain with vibrating walls: mathematical models for treatment of channel closing

15.00–15.30   Václav Kučera: On the time growth of the error of the discontinuous Galerkin method for advection-reaction problems

15.30–16.00   Jan Valášek et al.: Fluid-structure-acoustic interaction problem in modelling of human vocal folds vibration

Session B (Blue Hall, 7th floor) – session on New trends in domain decomposition methods – *chairman Martin Gander*

14.00–14.30   Martin Gander: Finite volume schemes and Schwarz methods for anisotropic diffusion image restauration

14.30–15.00	Michal Outrata: Optimized Schwarz methods with low-rank transmission conditions
15.00–15.30	Conor McCoid: A provably robust algorithm for triangle intersections
15.30–16.00	Pierre Marchand: Schwarz methods for the boundary element method (Online)

Session C (Conference room, 12th floor) – session on Novel methods in computational finance – *chairman Daniel Ševčovič*

14.00–14.30	Matthias Ehrhardt: High-order methods for parabolic equations in multiple space dimensions for option pricing problems
14.30–15.00	Zuzana Bučková, Beáta Stehlíková: Dynamic correlation in a convergence model of interest rates
15.00–15.30	Tatiana Jašurková, Beáta Stehlíková: Calibration of the Vašíček model of interest rates using bicriteria optimization
15.30–16.00	Beatriz Salvador Mancho (Online): XVA for a stochastic volatility model

16.00–16.30   **Coffee break**

16.30–18.30   Parallel sessions

Session A (Congress Hall, 8th floor) – session on Iterative methods with applications - fast, robust and parallelizable solvers – *chairman Radim Blaheta*

16.30–17.00	Radim Blaheta et al: Schwarz DD methods for coupled flow and elasticity in porous media
17.00–17.30	Michal Béreš et al.: Numerical models for coupled hydro-mechanics in disturbed continua
17.30–18.00	Jakub Kružík et al.: Convergence improvement of SMALXE and MPRGP algorithms
18.00–18.30	Simona Domesová: Surrogate accelerated sampling methods for Bayesian identification of material properties

Session B (Blue Hall, 7th floor) – session on Computational models for pharmacy and related areas – *chairman Jurjen Duintjer Tebbens*

16.30–17.00	Veronika Bernhauerová: Mathematical modelling of viral infections
17.00–17.30	Ctirad Matonoha: Adding spatial resolution to a pharmacodynamic model for nuclear receptors behavior
17.30–18.00	Karel Tůma: Light-activated shape memory polymers in bio-applications
18.00–18.30	Elfriede Friedmann et al.: A computational model for the drug treatment of age related macular degeneration

Session C (Conference room, 12th floor) – session on Novel methods in computational finance – *chairman Matthias Ehrhardt*

16.30–17.00	Soňa Kilianová: Transformation techniques of Hamilton-Jacobi-Bellman equations
17.00–17.30	Cyril Izuchukwu Udeani, Daniel Ševčovič: Application of maximal monotone operator method for solving Hamilton-Jacobi-Bellman equations
17.30–18.00	Igor Melicherčík et al.: Different ways of using second pillar savings in Slovakia
18.00–18.30	Terézia Fulová: Finding low-rank solutions in financial factor models

18.30–21.00   **Dinner**

Sunday, September 13th

Complementary activities of the ALGORITMY conference

1. **Hike to Kriváň**

07.00–08.45	Breakfast, participants take lunch in a packet from baskets in breakfast room
9.00	Departure of the conference bus to Štrbské pleso
9.30–17.00	Hike to Kriváň
17.00–22.00	Permon's Paradise

2. **Independent participants activities**

18.00–21.00   Dinner

Monday, September 14th

07.00–08.25   Breakfast

08.30–12.30   Online parallel sessions

Session A (<u>Congress Hall, 8th floor</u>) – session on Low and high-order numerical methods for porous media: developments and applications – *chairmen Daniele Di Pietro and Jérôme Droniou*

08.30–09.00	Iuliu Sorin Pop: Linear domain decomposition schemes for non-standard porous media flow models
09.00–09.30	Luca Formaggia: Some hybrid dimensional models for porous media flow
09.30–10.00	Simon Lemaire: Multiscale polytopal methods for highly heterogeneous diffusion problems
10.00–10.30	Jochen Schutz: A parallel-in-time IMEX multiderivative method

10.30–11.00   Coffee break and space for online discussion

11.00–11.30	Francesco Bonaldi: The gradient discretisation method for two-phase discrete fracture matrix models in deformable porous media
11.30–12.00	André Harnist: A hybrid high-order method for creeping flows of non-Newtonian fluids
12.00–12.30	Florent Hédin: A hybrid high-order method with non-matching meshes in discrete fracture networks
12.30–13.00	Stephan Garttner et al.: Efficiency of micro-macro models for dissolution/precipitation in two-mineral systems

Session B (<u>Blue Hall, 7th floor</u>) – session on New trends in numerical optimization and Advances in model order reduction and its applications – *chairmen Gabriele Ciaramella and Tim Keil*

09.00–09.30	Gabriele Ciaramella: On a greedy operator reconstruction algorithm
09.30–10.00	Anna Schlintl: All-at-once formulations of inverse problems within the Bayesian approach
10.00–10.30	Luca Mechelli: Reduced basis trust region method for PDE-constrained parameter optimization

10.30–11.00   Coffee break and space for online discussion

11.00–11.30	Dominik Garmatter: Reduced basis methods for Magnetic Resonance Electrical Impedance Tomography (MREIT) – On-site
11.30–12.00	Tim Keil: Advances for Reduced Basis methods for PDE-constrained optimization: a non conforming approach
12.00–12.30	Josua Sassen: Nonlinear reduced bases for the space of discrete shells

Session C (<u>Conference room, 12th floor</u>) – session on Numerical simulation of multiphase flow, transport and phase transitions – *chairmen Pavel Strachota and Robert Straka*

09.00–09.30	Pavel Strachota: CFD Simulation and experimental analysis of fluidization in a model of an oxyfuel fluidized bed boiler
09.30–10.00	Ferdinand Thein: The Riemann problem for a barotropic two fluid model
10.00–10.30	Aleš Wodecki: Efficiency of a hybrid parallel algorithm for phase-field simulation of polycrystalline solidification in 3D

10.30–11.00   Coffee break and space for online discussion

11.00–11.30	Kateřina Škardová: Investigation of blood-like non-Newtonian fluid flow in stenotic arteries using the Lattice Boltzmann method in 2D
11.30–12.00	Pavel Eichler: Lattice Boltzmann simulations of turbulent flow above rough surfaces
12.00–12.30	Ondřej Pártl: Mathematical modeling of non-isothermal compositional compressible fluid flow in zeolite bed and above its surface

Session D (<u>Conference room, 10th floor</u>) – session on Pressure-robust discretisations for flow problems and their applications – *chairman Christian Merdon*

09.00–09.30	Christian Merdon: A Gradient-robust discretisation of the compressible Stokes problem
09.30–10.00	Jürgen Fuhrmann: Quality preserving numerical methods for electroosmotic flow
10.00–10.30	Volker Kempf: Anisotropic pressure-robust discretizations of the Stokes equations
10.30–11.00	**Coffee break and space for online discussion**
11.00–11.30	Christian Kreuzer: Quasi-optimal and pressure robust Stokes discretisations
11.30–12.00	Daniel Castanon Quiroz: A hybrid high-order method for the incompressible Navier-Stokes problems robust for large irrotational body forces
12.00–12.30	Derk Frerichs: A really pressure-robust virtual element method for the Stokes problem
13.00–15.00	**Lunch**

15.00–17.00 Parallel sessions

Session A (<u>Congress Hall, 8th floor</u>) – contributed session on Numerical methods in flows – *chairman Petr Knobloch*

15.00–15.20	Lukáš Vacek, Václav Kučera: Traffic flow model on networks using numerical fluxes at the junctions
15.20–15.40	Gergö Ibolya, Karol Mikula: Numerical solution of the 1D viscous Burgers' and traffic flow equations by the inflow-implicit outflow-explicit finite volume method
15.40–16.00	Klára Jurčáková: Boundary-layer flows - challenges for measurement and numerical modeling
16.00–16.20	Richard Liska: Lagrangian Lax-Wendroff methods for hydrodynamic and elastoplastic flows
16.20–16.40	Miloslav Vlasák: On robustness of flux reconstructions - discontinuous Galerkin method

Session B (<u>Blue Hall, 7th floor</u>) – contributed session on Mathematical and numerical modelling in porous media flow and Earth sciences – *chairman Miroslav Tůma*

15.00–15.20	Patrik Mihala, Jozef Kačur: Water suspension infiltration with adsorption in unsaturated-saturated porous media
15.20–15.40	Johanna Blöcher, Michal Kuráž: On the issue of switching between non-freezing and freezing in soils
15.40–16.00	Jiří Vala: Modelling of micro- and macro-fracture in cementitious composites
16.00–16.20	Marek Macák et al.: On the finite element method for solving the oblique derivative boundary value problems in gravity field modelling
16.20–16.40	Jan Valdman: Matlab vectorization of FEM
16.40–17.00	Martin Ladecký: Well-conditioned finite element method for the periodic homogenisation

Session C (<u>Conference room, 12th floor</u>) – Online session on Innovative models and algorithms for inverse problems in imaging and image processing – *chairman Fiorella Sgallari*

15.00–15.30   Alessadro Lanza: Convex-nonconvex variational models for sparse-regularized inverse problems

15.30–16.00   Kostas Papafitsoros: Automatic distributed regularization parameter selection in total generalized variation based image reconstruction via bilevel optimization

16.00–16.30   Luca Calatroni: Accelerated iterative regularization via inertial dual diagonal descent

16.30–17.00   Andres Almansa: Solving inverse problems with neural regularizers and convergence guarantees

19.00–24.00   Conference dinner (<u>Halla Grande – 5th floor</u>) with Slovak food and wines, music and dancing

Tuesday, September 15th

07.30–08.55   Breakfast

Plenary lectures (Congress hall, 8th floor) – *chairman Miloslav Feistauer*

09.00–09.50   Stefan Volkwein (Online): Reduced basis methods for PDE-constrained parameters optimization

09.50–10.40   Alexander Linke (Online): On pressure-robust space discretizations and incompressible high Reynolds number flows

10.40–11.30   Check-out

12.00–14.00   Lunch