

Table of Contents of the Proceedings of the
28th International Conference on Domain Decomposition Methods

Plenary Lectures

Schwarz Waveform Relaxation and the Unmapped Tent-Pitching Method in 3D
Alberto Artoni, **Gabriele Ciaramella**, Martin Gander, and Ilario Mazzieri 17

Local Surrogate Models with Reduced Dimensionality via Overlapping Domain Decomposition and Proper Generalized Decomposition
Marco Discacciati, Ben J. Evans, and Matteo Giacomini 29

Nonlinear Monolithic Two-Level Schwarz Methods for the Navier-Stokes Equations
Axel Klawonn and **Martin Lanser** 41

Elimination Strategies for Nonlinear Preconditioning of Incompressible Navier-Stokes
Jinfeng Zhang, **Lulu Liu**, and David Keyes 53

Theory of Parallel Subspace Correction Methods for Smooth Convex Optimization
Jongho Park and Jinchao Xu 65

Overlapping Subspaces and Singular Systems with Application to Isogeometric Analysis
Andrea Bressan, Massimiliano Martinelli, and **Giancarlo Sangalli** 77

BDDC Preconditioners for 3D Virtual Element Discretizations of Saddle-Point Problems
Simone Scacchi, Tommaso Bevilacqua, Franco Dassi, and Stefano Zampini 89

Minisymposium 1: Nonlinear Preconditioning Techniques and Applications

Nonlinear Elimination Preconditioned Space-Time Solution Algorithms for Hyperbolic PDE Problems
Chang-Wen Liang and Feng-Nan Hwang 101

A Learning-Based Nonlinear Elimination Technique for Parameterized Incompressible Navier-Stokes Equations
Yingzhi Liu, Fenfen Qi, and Xiao-Chuan Cai 109

A Mathematical Model for the Simulation of the Hemodynamics in a Patient-Specific Kidney
Fenfen Qi, Yingzhi Liu, Rongliang Chen, and Xiao-Chuan Cai 117

Minisymposium 2: HPC for Training Large Neural Network Models

NNTile: A Machine Learning Framework Capable of Training Extremely Large GPT Language Models on a Single Node

Aleksandr Mikhalev, Aleksandr Katrutsa, Konstantin Sozykin, and Ivan Oseledets . . . 125

Minisymposium 3: Novel Solution Techniques: Theory and Applications

Adaptive Nonoverlapping Preconditioners for the Helmholtz Equation: Linear HDG
Yi Yu and Marcus Sarkis 133

Adaptive Nonoverlapping Preconditioners for the Helmholtz Equation: h-FEM
Yi Yu, Marcus Sarkis, Guanglian Li, and Zhiwen Zhang 141

Minisymposium 4: Domain Decomposition and Machine Learning Algorithms

ELM-FBPINN: Efficient Finite-Basis Physics-Informed Neural Networks
Samuel Anderson, Victorita Dolean, Ben Moseley, and Jennifer Pestana 149

Two-Level Trust-Region Method with Random Subspaces
Andrea Angino, Alena Kopanicakova, and Rolf Krause 157

Two-Level Deep Domain Decomposition Method
Victorita Dolean, Serge Gratton, Alexander Heinlein, and Valentin Mercier 165

Nonlinear Two-Level Schwarz Methods: A Parallel Implementation in FROSch
Alexander Heinlein, Kyrill Ho, Axel Klawonn, and Martin Lanser 173

Model Parallel Training and Transfer Learning for Convolutional Neural Networks by Domain Decomposition
Axel Klawonn, Martin Lanser, and Janine Weber 181

Domain Decomposition Method with Randomized Neural Networks
Yong Shang, Alexander Heinlein, Siddhartha Mishra, and Fei Wang 189

Minisymposium 5: Solvers for Innovative PDE Discretizations and Applications

A Computational Study of Algebraic Coarse Spaces for Two-Level Overlapping Additive Schwarz Preconditioners
Filipe Cumaru, Alexander Heinlein, and Hadi Hajibeygi 198

Adaptive and Frugal BDDC Coarse Spaces for Virtual Element Discretizations of a Stokes Problem with Heterogeneous Viscosity
Tommaso Bevilacqua, Axel Klawonn, and Martin Lanser 207

Minisymposium 6: Schwarz Methods for Steady and Evolution Problems

<i>What Transmission Conditions are Algebraically Chosen by RAS?</i> Martin Gander, Laurence Halpern, and Lahcen Laayouni	215
<i>SPAI Approximations of Inverses of Subdomain Matrices for AOSM</i> Martin Gander, Lahcen Laayouni, and Daniel Szyld	223
<i>Acceleration of Algebraic Optimized Schwarz Methods Using GPU Computations</i> Safae Bourhnane, Lahcen Laayouni, and Imad Kissami	231
<i>Nonlinear Schwarz Methods to Compute Geodesics on Manifolds</i> Marco Sutti and Tommaso Vanzan	239

Minisymposium 7: Time Parallel Time Integration

<i>An Abstract Approach to the Robin-Robin Method</i> Emil Engström and Eskil Hansen	247
<i>Space-Time Parallel Methods for Linear Elastodynamics</i> Stéphanie Chaillat, Marion Darbas, Martin Gander, and Laurence Halpern,	255
<i>A Parareal Algorithm Without Coarse Propagator?</i> Martin Gander, Mario Ohlberger, and Stephan Rave	263
<i>Time Parallelization of a Distributed Optimal Control Problem for the Wave Equation</i> Thanh Vuong Dang, Bérangère Delourme, and Laurence Halpern	271
<i>Continuous Analysis of Waveform Relaxation for Heterogeneous Heat Equations</i> Philipp Birken, Martin Gander, and Niklas Kotarsky	279

Minisymposium 8: Domain Decomposition Methods for High Frequency Wave Propagation

<i>Wavenumber Explicit Estimates of the Schwarz Preconditioner with Δ-GenEO Coarse Space for the Indefinite Helmholtz Problem</i> Victorita Dolean, Mark Fry, and Matthias Langer	287
<i>Schwarz Methods with PMLs for Helmholtz Problems: Fast Convergence at High Frequency</i> Jeffrey Galkowski, Shihua Gong, Ivan Graham, David Lafontaine, and Euan Spence	295
<i>Natural Damping of Time-Harmonic Waves and its Influence on Schwarz Methods</i> Martin Gander and Hui Zhang	303
<i>Optimization Methods for One Dimensional Elastodynamics</i> Theodoros Katsaounis, Grigorios Kounadis, Ioanna Mousikou, and Athanasios Tzavaras	

Coarse Spaces Based on Higher-Order Interpolation for Schwarz Preconditioners for Helmholtz Problems

Erik Sieburgh, Alexander Heinlein, Vandana Dwarka, and Cornelis Vuik 319

Minisymposium 9: Coarse Spaces and Transmission Conditions

Coupling Conditions and Two-Level Methods on Graphs

Martin Gander, Florence Hubert, and Magali Ribot 327

Merged Q_1 Coarse Spaces for Schwarz Methods in 2D and 3D

Martin Gander and Serge Van Criekingen 335

Minisymposium 10: Polygonal Finite Elements, Discontinuous Galerkin and Related Methods

An Iterative Algorithm for Neural Network Approximation to Partial Differential Equations by Using Nonoverlapping Subdomain Partitions

Hyea Hyun Kim and Hee Jun Yang 343

Minisymposium 11: Transmission Conditions in Domain Decomposition and Optimal Control

Variable Reduction as a Nonlinear Preconditioning Approach for Optimization Problems

Gabriele Ciaramella and Tommaso Vanzan 351

Decompose-then-Optimize Versus Optimize-then-Decompose for the Poisson Problem in Minimization Form

Pierre-Henri Cocquet and Martin Gander 359

Non-Overlapping Schwarz Methods in Time for Parabolic Optimal Control Problems

Martin Gander and Liu-Di Lu 367

Techniques to Study Spectral Properties of the Robin-Schwarz Operator at the Continuous Level

Daniel Bennequin, François Cuvelier, Martin Gander, and Laurence Halpern 375

Nonoverlapping Domain Decomposition of Parabolic Optimal Control Problems Revisited: Decompose-then-Optimize Versus Optimize-then-Decompose

Martin Gander and Günter Leugering 383

Efficient Solution of State-Constrained Distributed Parabolic Optimal Control Problems

Richard Löscher, Michael Reichelt, and Olaf Steinbach 391

Minisymposium 12: Solvers for Large-Scale Parallel Computations

<i>Cell-by-Cell Modelling of Electrical Signaling in Myelinated Axons</i> Alessandro Gatti, Pietro Benedusi, and Simone Pezzuto	399
<i>Parallel Iterative Solvers for Discretized Reduced Optimality Systems</i> Ulrich Langer, Richard Löscher, Olaf Steinbach, and Huidong Yang.....	407
<i>An Immersed Domain Method for Fluid-Structure Interaction with Contact</i> Maria Nestola, Patrick Zulian, Diego Rossinelli, and Rolf Krause	415

Contributed Presentations

<i>Schwarz Methods for Mixed Problems</i> Ronald Haynes	423
<i>Combining FETI-DP Methods and Quasi-Newton Methods Using an SQP Approach</i> Stephan Köhler and Oliver Rheinbach.....	431
<i>Convergence of Neumann-Neumann Waveform Relaxation Algorithm with Time-Dependent Relaxation Parameter for Time-Fractional Sub-Diffusion and Diffusion-Wave Problems</i> Bankim Mandal and Soura Sana	440