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PREFACE
A SPECIAL ISSUE DEDICATED TO JOACHIM GWINNER

We are delighted to dedicate this special issue to Professor Joachim Gwinner on the occasion of his 70th birthday. Prof. Gwinner made an indelible mark in a multitude of directions related to theoretical and computational aspects of deterministic and stochastic variational inequalities. His notable contributions include novel error estimates, penalization and regularization techniques, fixed-point theorems and iterative methods, nonsmooth mechanics, inverse problems of estimating parameters in variational inequalities, Nash equilibrium problems, nonsmooth and multi-objective optimization, and many more.

This special issue will acknowledge and celebrate Prof. Gwinner's original and far-reaching ideas as a researcher of the highest caliber by gathering some of the most recent advancements in variational inequalities and related subjects.

This special issue is comprised of nine articles whose contributions are as follows. We start with more analytical topics and move towards numerical issues.

J. R. González Granada, and V. A. Kovtunenko, in the paper entitled "A Shape Derivative for Optimal Control of the Nonlinear Brinkman Forchheimer Equation," study the stationary equilibrium problem and the inverse problem of shape optimal control for a generalized Brinkman–Forchheimer equation under divergence-free and mixed boundary conditions. They treat an equilibrium-constrained optimization using an adjoint state and the Lagrange approach for a convex objective function. The shape differentiability of a Lagrangian, a Hadamard representation of the shape derivative using boundary integrals, applications to path-independent integrals, and a gradient descent method are presented.

M. Brokate and P. Krejčí, in the paper entitled "A Variational Inequality for the Derivative of the Scalar Play Operator," demonstrate that the directional derivative of the scalar play operator is the unique solution to a certain variational inequality. The variational inequality is shown to have an integral form based on the Kurzweil-Stieltjes integral due to the discontinuities involved.

In the paper "A Tikhonov-type regularization for Brézis pseudomonotone equilibrium problems in Banach spaces", the focus of O. Chadli is on giving existence theorems for equilibrium problems with pseudomonotone bifunctions by employing the Tikhonov regularization and a Galerkin-type method.

M. Ait Mansour, M. A. Bahraoui, and A. El Bekkali, in the paper "Approximate solutions to quasi-equilibrium problems: Lipschitz dependence of solutions on parameters," propose a new notion of approximate solutions to quasi-equilibrium problems and, as an application, discuss several approximations for quasi-variational inequalities. Sensitivity analysis, sharp estimates, and stability results related to traffic network models are discussed.

H. Gimperlein, M. Maischak, and E. P. Stephan in the contribution entitled "FE–BE Coupling for a Transmission Problem Involving Microstructure," analyze a finite element/boundary element procedure for a non-convex contact problem for the double-well potential. The associated functional is relaxed so that the degenerate minimization problem reduces to a boundary/domain variational inequality. The convergence of the Galerkin approximations and the corresponding a posteriori estimate for the approximation error are studied. Numerical results demonstrate the performance of the proposed method.

The primary focus of L. Banz and A. Schröder in the paper entitled "Posteriori Error Control for Variational Inequalities with Linear Constraints in an Abstract Framework," is to study a linearly constrained variational inequality and to propose a posteriori error control for the discretization. The developed framework is applied to the obstacle problem and a simplified Signorini problem, where higher-order finite elements are used to provide appropriate discretization spaces. The numerical results show the feasibility of the developed framework.

B. Kaltenbacher and M. Thalhammer in the paper "Convergence of implicit Runge–Kutta time discretization methods for fundamental models in nonlinear acoustics," propose a new class of implicit Runge–Kutta time discretization methods for nonlinear damped wave equations arising in nonlinear acoustics and under suitable regularity, consistency, and smallness

requirements on the time-continuous solutions, obtain global error bounds from energy estimates for the time-discrete solutions. They prove the existence and uniqueness of time-discrete solutions and the convergence under weaker conditions on the initial data.

The goal of the work "A Dynamic Supply Chain Network for PPE during the COVID-19 Pandemic" by P. Daniele and D. Sciacca is to present an optimization model consisting of a dynamic supply chain network related to Personal Protective Equipment (PPE). Assuming that the flows on arcs and additional capacities on arcs depend both on time and a delay function, the network model aims to find the optimal flows and the optimal additional capacities on arcs to satisfy the increasing demand due to the spread of the COVID-19 disease, minimizing, simultaneously, its total costs. The optimization problem is explored in a variational inequality framework utilizing the associated projected dynamical system for numerical simulations.

N. N. Tam, C.-F. Wen, J.-C. Yao, and N. D. Yen, in the paper "Structural Convexity and Ravines of Quadratic Functions" study structural convexity and propose a verifiable criterion for structural convexity of a quadratic function and show that such a function cannot have ravines along linear subspaces.

In conclusion, we express our sincere gratitude to all the authors who have contributed to this special issue and the reviewers who helped us with their thorough and helpful reviews. We thank also the Editor in Chief, Akhtar Khan, who assisted us in many ways, not only but in particular in writing this Preface.

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