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Editorial

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EDITORIAL

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A seminar on Numerical Analysis and Winter School 2019 (SNA'19) was held in Ostrava, January 21–25, 2019, and organized by the Institute of Geonics (IGN) of the Czech Academy of Sciences in cooperation with VŠB-Technical University of Ostrava (VŠB). It was already the 14th meeting in the series of SNA events, which help to join Czech community working in the field of numerical mathematics and computer simulations. Besides IGN and VŠB, these meetings have been supported by the Institute of Mathematics and Institute of Computer Science of the Czech Academy of Sciences, the Charles University, the Czech Technical University in Prague and other institutions.

The conference chairman of SNA'19 was Prof. Radim Blaheta, who also organized many previous SNA events, including the first SNA in 2003 devoted to the 70th birthday of Prof. Ivo Marek. The Winter School, promoted by Prof. Zdeněk Strakoš, has become a part of SNA since 2005. Other details about the history of SNA and also the obituary devoted to Prof. Ivo Marek can be found in Applications of Mathematics Vol. 62 (2017), No. 6, pp. 535–536 and 719–721.

SNA'19 was attended by 74 participants, who presented invited lectures within the Winter School and more than 40 contributions in the form of oral presentations and posters. The Winter School lectures were devoted to the following topics:

- ▷ High-performance variants of Krylov subspace methods (*E. Carson*),
- ▷ An introduction to extended finite element methods (*J. Haslinger*),
- ▷ On the way from matrix to tensor computations (*M. Plešinger*),
- ▷ Guaranteed eigenvalue bounds for elliptic partial differential operators (*T. Vejchodský*).

Besides the high scientific level, the seminar had a rich social program and was held in a friendly atmosphere.

This special issue of Applications of Mathematics contains four papers presented at SNA'19. Their brief description is listed below.

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E. C. Carson presents a new algorithmic variant of the conjugate gradient method designed to reduce data movement on modern high-performance computers. This work improves upon the existing adaptive s-step conjugate gradient formulation by making use of iteratively updated Ritz value estimates. It is shown through numerical experiments that this approach can significantly improve the numerical behavior of the conjugate gradient iterations.

M. Vlasák derives a posteriori estimates for the reaction-convection-diffusion equation with limited convection based on the flux reconstruction. Finite elements of Lagrange's type with the polynomial degree p are considered. It is shown for the 1D case that local efficiency of estimates depends only on $p^{1/2}$. The results are illustrated on numerical examples.

L. Foltyn, D. Lukáš, and I. Peterek deal with the parallel solution of the model heat equation. In particular, the parareal decomposition method is used for time and the nonoverlapping Schur complement or overlapping Schwarz domain decomposition methods are considered for space. The suggested techniques are tested on numerical examples in 1D and 2D.

M. Béreš examines different approaches to the construction of the reduced basis for the stochastic Galerkin matrix equations, namely the reduced rational Krylov subspace method and Monte Carlo sampling approach. The paper is focused on comprehensive testing of problems with real-life like parameters. An efficient and parallelizable framework including the use of the deflated conjugate gradients is also presented.

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