

# Applications of Mathematics

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Editorial

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## EDITORIAL

JAN CHLEBOUN, Praha

This issue of *Applications of Mathematics* is special for two reasons. First, it is a special issue on the occasion of the conference Programs and Algorithms of Numerical Mathematics 20 (PANM 20), June 21–26, 2020, traditionally and (except for a minor aberration) biennially organized by the Institute of Mathematics of the Czech Academy of Sciences.

Second, a paper without any relation to the conference has been incorporated into this issue because the Editorial Board believes that it deserves to be published as a nice example of an application of mathematics though its length is somewhat unusual.

The roots of the PANM Conference can be traced back to 1983 when the first meeting was held in Alšovice, a locality South-East of Liberec. Later on, the conference traveled through various places in the Jizera Mountains with the only exception of 2006, when the conference took part in Prague, was organized in honor of Ivo Babuška's 80th birthday, and enjoyed the presence of this founder of *Appl. Math.*

As the initialism PANM 20 indicates, the 20th meeting took place in 2020 and has set up a new milestone in the sequence of the PANM conferences. Just as during PANM 19, the participants were hosted in the International Center of Spiritual Rehabilitation situated in a renovated monastery in Hejnice, a locality on the northern edge of the Jizera Mountains.

The organizing committee faced a tough decision due to COVID-19 restrictions. Finally, traditional face-to-face conference gained support in hopes that the restrictions would be lifted in late spring. This belief proved correct and fifty participants met in Hejnice to listen to seven invited lectures as well as thirty one oral presentations and to discuss eight posters. The PANM 20 proceedings contain sixteen papers.<sup>1</sup> I am grateful for the efforts of some participants resulting in three longer papers that form the core of this special issue.

Jiří Vala and Vladislav Kozák present a study of damage modeling of quasi-brittle composites. Their paper covers a theoretical background, the formulation of the

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<sup>1</sup> Available at <https://dml.cz/handle/10338.dmlcz/703093>.

underlying mathematical problem and its computational version, existence and convergence results, and computational examples focusing on cracks in reinforced cement paste.

The subject of the paper by Jakub Ševčík, Lukáš Adam, Jan Příkryl, and Václav Šmídl lies in the intersection of mathematics as well as electrical and transportation engineering. The authors are concerned with the problem of maximum power demands in a trolleybus network that can be supplied by available sources. After the mathematical problem is formulated, an algorithm is proposed to solve it, and then applied to both benchmark tests and simulations of trolleybus traffic in Pilsen.

Jiří Hozman and Tomáš Tichý are regular contributors to *Appl. Math.*; see their three papers on option pricing problems solved by the discontinuous Galerkin method (DGM) published in 2017 and 2019. The article included in this issue is in the same line of the DGM and option pricing. From the mathematical point of view, the goal is to solve partial integro-differential equations arising from the European as well as American option pricing model when the underlying asset follows an exponential variance gamma process. The authors pay attention to building a mathematical model as well as to its discretization and benchmark tests.

As already noted, the article by Tomáš Bayer and Milada Kočandrová does not originate from the PANM 20 Conference. It deals with cartography, namely with inversions of the family of sphere-to-plane projections named after US cartographer A. J. van der Grinten.

In this case, the application of mathematics is represented by a synthesis of high school algebra, geometric constructions, differential calculus, partial differential equations, and, if no analytical solution is available, numerical methods. The subject is also visually appealing as the reader can experience through the pictures of maps.

The COVID-19 measures have affected not only the conference and the authors but also the entire reviewing process, which became somewhat delayed. I thank the reviewers for their willingness to write peer review reports.

Let me recall my colleagues from the PANM 20 organizing committee: Pavel Kůs, Petr Příkryl, Miroslav Rozložník, Karel Segeth, Jakub Šístek, and Tomáš Vejchodský. I wish to thank all of them for their active involvement. Special thanks, however, deserves Jakub for his lion share of organizing the event, as well as Ms. Hana Bílková and Ms. Růžena Roháčková for their helping hands.

Last but not least, I would like to thank the editorial staff of *Appl. Math.*, namely Ms. Eva Ritterová, the executive editor. The special issue would have hardly been produced without her responsible and devoted approach.

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