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Editorial

Editorial Conclusion for the Special Issue "Advances in Computational Mechanics for Symmetrical Engineering Systems"

Chong Wang [1,*] and Menghui Xu [2]

[1] Institute of Solid Mechanics, Beihang University, Beijing 100191, China
[2] Faculty of Mechanical Engineering & Mechanics, Ningbo University, Ningbo 315211, China
* Correspondence: chongwang@buaa.edu.cn

In this Special Issue, the recent advances in computational mechanics for symmetrical engineering systems are reviewed, including many novel techniques in mathematical modeling, numerical simulation, uncertainty quantification, optimization theory and artificial intelligence that were developed to provide reliable solutions to symmetry-related mechanical problems. Most importantly, the methods proposed and discussed in this Special Issue have high generality and great tolerance, which can be effectively applied in other engineering areas with necessary extension.

Regarding the vital role of computational mechanics for analysis and design in many complex systems, such as the aerospace industry, civil engineering, mechatronics, material fabrication and so on, the guest editors conducted a selective comprehensive review process for each submission based on the journal's policy and guidelines. For this Special Issue, we received seven submissions, and after a comprehensive review process, five high-quality works have been accepted for publication (the acceptance rate was around 0.71).

Kim et al. [1] conducted an asymmetric design sensitivity analysis and isogeometric shape optimization of elastic bodies subjected to the path-dependent loads, where the load stiffness matrix was derived by linearizing the nonlinear non-conservative load and the geometrically nonlinear structure was optimally designed based on the total Lagrangian formulation within an isogeometric framework. Subsequently, under uncertain circumstances, Sleesongsom et al. [2] investigated the multi-objective reliability-based optimization design of an aircraft structure and presented a novel two-step analysis strategy that could greatly reduce the analysis complexity and enhance the efficiency of predicting the possibility safety index. Additionally, as the surrogate-model-assisted practices have obtained ever-increasing attentions in recent decades for uncertainty-related symmetrical engineering systems, Wang et al. [3] accomplished a comprehensive review of surrogate modeling methods available for uncertainty quantification and propagation. Besides the popular single and hybrid surrogate models, state-of-art experimental design technologies including one-shot and adaptive sampling strategies were discussed in detail.

In another interesting study, Tseng and Kao [4] proposed a user selection approach for symmetric non-orthogonal multiple-input multiple-output (MIMO) systems. With a customized loss function satisfying constraints in the strong/weak sets, a deep neural network was trained based on data obtained by the proposed optimal user selection (exhaustive search) approach, which significantly alleviated the computational burden.

In addition to engineering applications, Cui and Jiang [5] conceived a rigorous mathematical exposition of a generalized multivariate Birkhoff interpolation scheme and introduced notions of invariant interpolation space and singular interpolation space. In this study, the performance of targeted space spanned by the monomial sequence was assessed solely by the property of the incidence matrix, which further simplified the computational complexity.

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In conclusion, the guest editors have done their best in selecting papers covering the major topics of computational mechanics to adequately contribute to the existing literature and fill in several critical gaps in the critical work on theory, models and algorithm. The guest editors would like to thank the Editor-in-Chief, Prof. Dr. Sergei D. Odintsov, the editorial team and the reviewers of *Symmetry*, who helped us in the journey to publish this Special Issue.

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References

1. Kim, M.G.; Koo, B.; Han, Y.S.; Yoon, M. Asymmetric design sensitivity and isogeometric shape optimization subject to deformation-dependent loads. *Symmetry* **2021**, *13*, 2373. [CrossRef]
2. Sleesongsom, S.; Kumar, S.; Bureerat, S. Two-step multi-objective reliability-based design optimization of aircraft wing structures. *Symmetry* **2022**, *14*, 2125. [CrossRef]
3. Wang, C.; Qiang, C.; Xu, M.; Wu, T. Recent advances in surrogate modeling methods for uncertainty quantification and propagation. *Symmetry* **2022**, *14*, 1219. [CrossRef]
4. Tseng, S.M.; Kao, S.C. User selection approach in multiantenna beamforming NOMA video communication systems. *Symmetry* **2021**, *13*, 1737. [CrossRef]
5. Cui, K.; Jiang, X. Invariant interpolation space for generalized multivariate birkhoff interpolation. *Symmetry* **2022**, *14*, 889. [CrossRef]