

Introduction to the Special Issue on Recent Developments of Isogeometric Analysis and Its Applications in Structural Optimization

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Isogeometric analysis (IGA), which aims at integrating CAD and CAE models, is one of the most active research topics in both computational mechanics and computer-aided geometric design. The rapidly growing interests in IGA has led to profound developments of relevant theories and applications, one of which being structural optimization. With the rapid growth of researches in IGA, this special issue contributes to highlight recent developments, challenges and opportunities of IGA and IGA-based structural design optimization, with focuses on theory development, numerical implementations and potential applications.

This special issue is organized by six guest editors who have made important contributions in the field of IGA and IGA-based design and structural optimization. There are 13 papers accepted after a critical peer review process. The topics include analysis-suitable parameterization methods, isogeometric shape and topology optimization, multiscale isogeometric structural optimization, and others.

We summarize the accepted papers in this special issue as follows:

In the paper entitled "Data-driven structural design for petal-shaped auxetics using isogeometric analysis" by Wang et al. [1], the authors propose a back-propagation neural network (BPNN) based design framework for petal-shaped auxetics using IGA. The BPNN-based fitting method is used to build the nonlinear relation between the input geometry variables and the effective material properties, which enable an easy analytical sensitivity analysis, in contrast to the generally complex procedures of typical shape and size sensitivity approaches.

Wu et al. [2] present an approach to reuse the basis function evaluations in the numerical integration of IGA in the paper entitled "Reusing the evaluations of basis functions in the integration for isogeometric analysis". The authors classify the bases on the original level and then reuse them on the refined level, which can reduce the time for basis calculations at integration nodes. By using the sum factorization method and the mean value theorem for the integrals, an integration method with high efficiency is proposed.

In the paper "Multiresolution isogeometric topology optimization using moving morphable voids" studied by Du et al. [3], a general and new explicit isogeometric topology optimization approach with moving morphable voids (MMV) is proposed. In this approach, a novel multiresolution scheme with two



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