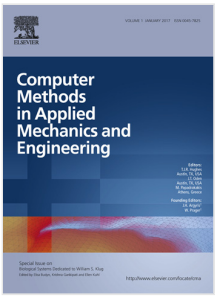
Accepted Manuscript



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PII: S0045-7825(17)30197-4
DOI: http://dx.doi.org/10.1016/j.cma.2017.02.004
Reference: CMA 11331

To appear in: *Comput. Methods Appl. Mech. Engrg.*

Received date: 29 January 2017
Accepted date: 2 February 2017

Please cite this article as: C. Ding, X. Cui, G. Huang, G. Li, K.K. Tamma, Exact and efficient isogeometric reanalysis of accurate shape and boundary modifications, *Comput. Methods Appl. Mech. Engrg.* (2017), http://dx.doi.org/10.1016/j.cma.2017.02.004

Exact and efficient isogeometric reanalysis of accurate shape and boundary modifications

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Abstract

In the traditional design-through-analysis pipeline, geometric models and modifications are approximately represented and transformed with computational models. Besides, after each modification, the latest design often needs to be completely analyzed again leading to reanalysis. These procedures produce many errors and are extremely time-consuming. Therefore, in this paper, we propose a novel, and an exact and efficient isogeometric reanalysis methodology of accurate shape and boundary modifications that improves the totality of integration of design and analysis greatly. Geometric models and shape modifications are exactly represented and transformed. And, the corresponding computational models will change simultaneously when the geometric models are modified; thereby, reducing error and time in model representation and transformation. Furthermore, we extend and propose the isogeometric based exact reanalysis method termed Indirect Factorization Updating (IFU) with the combination of isogeometric based reanalysis. The method can efficiently obtain the exact solution of the modified structure, without solving the complete set of modified equations of the new structure. It is also applicable to all techniques for representing the CAD geometry model and complex problems. Several examples illustrate and verify the accuracy and efficiency of this proposed method; and furthermore, the larger the scale of the problem, the more advantageous the end result will be.

Key words: Isogeometric Analysis (IGA); Exact Reanalysis; Indirect Factorization Updating (IFU); Shape and Boundary Modifications

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