

Accurate reliability evaluation of complex structures based on isogeometric analysis

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Abstract

For complex structures, FEA-based reliability analysis still remains as an extremely challenging task due to the huge computational burden. By contrast, isogeometric analysis (IGA) can provide better prediction accuracy of structural performance and also fully analytical sensitivity, which is particularly suitable for complex structural reliability analysis. In this study, an IGA-based reliability evaluation framework is proposed to calculate high-order sensitivity for reliability analysis process, in order to boost the computational efficiency. Compared to the traditional methods, including FEA-based method and first-order reliability method, the robustness, accuracy and efficiency of proposed methods are verified by several numerical benchmarks. It is expected that the proposed framework can be utilized in the practical design of complex aerospace shell structures.

Keywords: Reliability evaluation; isogeometric analysis; complex structure