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**Modified semi-analytical sensitivity analysis methods for structural design optimization.**

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**Summary:** A modified algorithm for semi-analytical sensitivity analysis is presented in this investigation, which facilitates program implementation and possesses excellent numerical stability feature with respect to perturbation step length of design variables. Firstly, a modified semi-analytical sensitivity analysis technique based on global structural equations is proposed for static displacement and stress problems, and its program implementations are provided. Subsequently, the modified method is extended for other analysis tasks including natural frequency, linear buckling and dynamic transient analysis. Meanwhile, the modified method is verified by typical finite element models with beam and shell elements. The results highlight the applicability of the modified method to various analysis types mentioned above, and the accuracy as well as the efficiency are enhanced by the modified methods. Especially, the methods exhibit excellent stable features with respect to perturbation step length of design variables and thus will be more suitable for shape optimization of complex engineering structures.

**MSC:**

[74P10](#) Optimization of other properties in solid mechanics

**Keywords:**

structural optimization; semi-analytical sensitivity analysis technique; shape optimization; modified algorithm

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