

Reliability analysis of all components in structural systems based on adaptive point estimate method and the principle of maximum entropy

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Abstract

It is a significant topic to analyse the reliability level of all components in structural systems accurately and efficiently. In this work, a reliability method for all components in structural systems based on adaptive point estimate method [1,2,3] and the principle of maximum entropy is proposed. There are several advantages of proposed method that are: the required number of structural analysis is irrelevant to the number of components, the computation process is easy to implement without iterations, and the accuracy can satisfy the need for engineering problems. Firstly, the first four moments of all components is calculated based on the combination of adaptive delineation of cross terms and bivariate dimensional decomposition. Secondly, the principle of maximum entropy is introduced to evaluate the reliability index of all components based on the first four moments accordingly. Lastly, several examples are investigated to compare the accuracy and efficiency of Monte Carlo method, response surface method and proposed method. Conclusions can be drawn that the proposed method has significant advantage in efficiency when compared with Monte Carlo method and response surface method, and the proposed method is easy to implement with satisfactory accuracy for engineering problems.

References

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