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Structural reliability calculation for multiple failure modes based on an active learning Kriging model

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Abstract: A multi-output Kriging model is used as the surrogate model to solve a problem of structural reliability calculation with multiple failure modes. In this study, the surrogate model is constructed only once for all performance functions, without having to construct a separate surrogate model for each function, and the correlation between failure modes can be considered in the modeling process. The initial sample points given by the proposed method consider not only the region near the mean of the random variables, but also the edge region of the design space, and the initial surrogate model has better accuracy in the global space, so that the number of updating the surrogate model by using learning functions is reduced. Numerical examples show that the proposed method can achieve satisfactory accuracy, and the proposed method can greatly improve efficiency especially for a large number of failure modes.

Key words: reliability; multiple failure modes; surrogate model; multi-output Kriging; learning functions

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