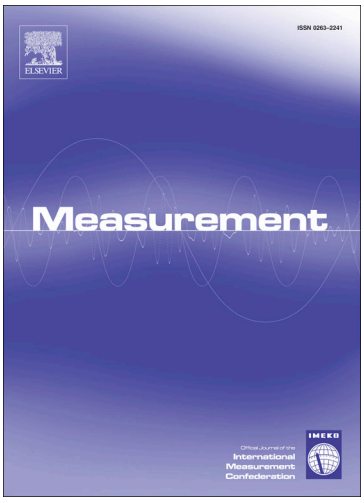

A multi-state model updating method for structures in high-temperature environments

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A multi-state model updating method for structures in high-temperature environments

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HIGHLIGHTS

- A novel model updating method for structures in high temperature is presented;
- The method preserves the physical meanings of updating parameters;
- Parameters with different tendencies are updated simultaneously;
- Presented method is validated with a composite laminate panel test data.

Abstract

A multi-state model updating method is studied to solve the problem of updating finite element model of structures in high-temperature environments. The key to the problem is to update temperature dependent parameters like elastic modulus and temperature independent parameters like density properties simultaneously in different states. Traditional multi-model updating method only deals with problems with constant parameters in different boundary conditions. To develop the method, specific constraint matrix was designed and an improved Sequential Quadratic Programming method was used to solve the problem. The vibration test of a carbon fibre reinforced bismaleimide composite laminate plate in the high-temperature environments was used to verify the method. The finite element model of the plate in different temperature boundary conditions was updated simultaneously utilizing the presented method. Compared with the traditional method, the multi-state model updating method got a similar updating result. In the meanwhile, it remains the physical meaning of parameter-temperature relations and was proved to be computational efficient with the introduction of additional constraints.