

A Comparative Assessment of Modal Parameters and Flutter Derivatives Using Multiple Output-Only System Identification Methods

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ABSTRACT

The wind tunnel tests including the bridge profile test and the scaled-down bridge model test are important for analyzing bridge stability and modifying the design profile. It can provide critical information regarding the aerodynamic behavior of the bridge through the flutter derivative. In recent years, research in wind engineering has commonly utilized the Modified Ibrahim Time Domain Method (MITD) to determine flutter derivatives through free vibration tests. It can deliver the buffeting force effects through an iteration method within a smooth flow. This paper proposes the Output-only Stochastic Subsystem Identification (SSI) method to identify the flutter derivatives. The advantage of SSI is that it can identify the flutter derivatives through the random vibration data of the bridge under various wind speeds. This paper will present the results obtained under various wind speeds using three distinct system identification methods. It can demonstrate the accuracy of the results obtained through SSI. The modal parameters can also be identified using the proposed SSI methods. It can be seen that the identified frequencies are consistent with the designed frequencies. The applicability and accuracy of the Stochastic Subspace Identification method (SSI) in wind tunnel tests are illustrated.

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