



Experimental Verification of Improved SSI-COV Method for Health Monitoring of Base-Excited RC Structures

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Abstract

Condition assessment of civil infrastructures using operational modal analysis (OMA) has gained immense popularity in the recent past. OMA, being a non-destructive technique, can be directly employed utilizing structural vibration, i.e., measurements due to ambient excitation. It is versatile and fairly accurate for the frequency range generally encountered in structural engineering. A more improved version of this tool, i.e., covariance-driven Stochastic Subspace Identification (SSI-COV), has emerged as a popular signal processing tool for modal identification of structures owing to its minimal input requirements and simultaneous multi-mode identification ability. The SSI-COV compiles the multiple channel data before the identification step to obtain one set of global modal parameters, taking advantage of different ambient excitation characteristics of measurements. However, to achieve best results, characteristics of excitation acting on the structural system and response signals quality should meet certain requirements, which sometimes are difficult to satisfy. In this study, experimental verification is conducted using an improvised variant of the SSI-COV technique based on agglomerative hierarchical clustering for modal identification of a full-scale reinforced concrete framed building in the IIT Guwahati campus subjected to multi-component earthquake excitations. The results obtained are compared with the structure's theoretical model to validate the proposed method's performance.

Keywords: Stochastic subspace identification, Structural health monitoring, Agglomerative hierarchical clustering