

Damage Localization of Deterministic-Stochastic Systems

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Abstract : A scheme integrated with deterministic-stochastic subspace system identification and the method of damage localization vector is proposed in this study for damage detection of structures based on seismic response data. A series of shaking table tests using a five-storey steel frame has been conducted in National Center for Research on Earthquake Engineering (NCREE), Taiwan. Damage condition is simulated by reducing the cross-sectional area of some of the columns at the bottom. Both single and combinations of multiple damage conditions at various locations have been considered. In the system identification analysis, either full or partial observation conditions have been taken into account. It has been shown that the damaged stories can be identified from global responses of the structure to earthquakes if sufficiently observed. In addition to detecting damage(s) with respect to the intact structure, identification of new or extended damages of the as-damaged (ill-conditioned) counterpart has also been studied. The proposed scheme proves to be effective.

Keywords : damage locating vectors, deterministic-stochastic subspace system, shaking table tests, system identification

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