Damage localization using controllable inputs: an experimental study

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ABSTRACT
The recently proposed Shaped Damage Locating Input Distribution (SDLID) method locates structural damage by active interrogation with controllable inputs. The methodological premise is to shape these inputs such that certain steady-state vibration features (depending on the type of damage to be located) are rendered dormant in one subdomain at a time. As such, damage is localized when the vibration response induced by the shaped inputs in the damaged state corresponds to that stored for the reference state. Previously, the SDLID method, which operates free of system identification, has been tested through numerical simulations and, in this context, demonstrated its merits; namely, a low demand on output sensors, robustness towards noise, and conceptual simplicity. This paper presents an experimental application study, in which the SDLID method is used to locate different mass perturbations in a frame structure investigated using two actuators delivering harmonic excitation. Based on steady-state acceleration measurements, it is shown how the method succeeds in locating all the added mass perturbations.

Keywords: Structural health monitoring, Damage localization, Damage identification, Experimental study.