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Editorial

Identification of Incipient Damage Using High-Frequency Vibrational Responses

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Damage identification relying on low-frequency vibrational responses, usually lower than 4th order natural frequencies or so, has dominated the area of vibration-based structural damage diagnosis over recent decades, primarily owing to the limited capacity of traditional apparatus in vibration measurement. In this respect, it is commonly acknowledged that low-frequency vibrational responses are insensitive to small damage; moreover, small damage is more easily accommodated by higher-frequency vibrational responses. This recognition has motivated the development of damage identification methods based on higher-frequency vibrational responses. Currently, new advanced instrumentation typified by the scanning laser vibrometer (SLV) has made it possible to measure high-frequency vibrational responses of a structure precisely and accurately, providing the opportunity to develop damage identification methods using high-frequency (here beyond 4th order) vibrational responses. These high-frequency methods hold promise for solving the critical problem: detection of incipient damage, most crucial for ensuring structural safety. Nevertheless, unlike methods using low-frequency vibrational responses, damage identification relying on high-frequency vibrational responses poses a series of new theoretical and numerical issues that need to be clarified. With this motivation, we have collected papers on this topic in this special issue on identification of incipient damage using high-frequency vibrational responses.

This special issue contains six original research papers that concern various aspects of damage identification relying on high-frequency vibrational responses, including effects of contraction joints on vibrational characteristics of arch dams, diagnosis of bearing defects, estimation of modal properties of low-rise buildings, reliability analysis of damaged beam spectral element, identification of structural damage in bridges using high-frequency vibrational responses, and safety evaluation index of blast vibration.

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