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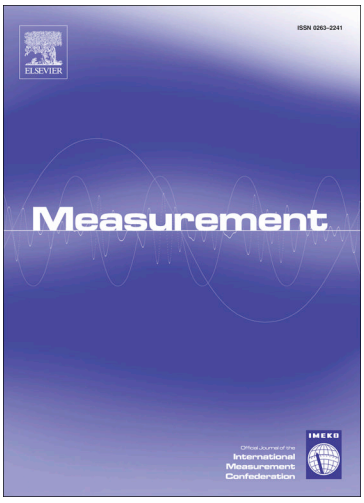


# A damage detection method based on strain modes for structures under ambient excitation

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# A damage detection method based on strain modes for structures under ambient excitation

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**Abstract:** Vibration-based damage detection methods play a vital role in structural health monitoring, but there are many problems in the application of those traditional damage detection methods; for instance, the ability to promptly sense and accurately locate realistic damage in structures are the primary challenges confronting traditional damage detection methods. Strain modes typically have high sensitivity in structural damage detection. Thus, this paper defined a novel damage detection method based on strain modes. According to the relationship between strain and displacement, the natural excitation technique based on the strain response combined with the eigensystem realization algorithm was applied to identify the strain modal parameters of structures under ambient excitation. The detection index was also employed to localize damage. Crack and corrosion damage of beam-type structures was simulated under experimental conditions. Next, single-damage and multi-damage cases with different degrees and locations were prefabricated experimentally. The results demonstrated that all damage cases were detected in a reasonable manner, thereby demonstrating the validity of the proposed method in structural damage detection.

**Keywords:** structural health monitoring; damage detection; strain modes; ambient excitation; natural excitation technique; eigensystem realization algorithm[1]

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