

Accepted Manuscript

Applications of Higher-Order Frequency Response Functions to the Detection and Damage Assessment of General Structural Systems with Breathing Cracks

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PII: S0020-7403(18)30790-2
DOI: <https://doi.org/10.1016/j.ijmecsci.2018.08.027>
Reference: MS 4485



To appear in: *International Journal of Mechanical Sciences*

Received date: 12 March 2018
Revised date: 20 August 2018
Accepted date: 23 August 2018

Please cite this article as: R.M. Lin , T.Y. Ng , Applications of Higher-Order Frequency Response Functions to the Detection and Damage Assessment of General Structural Systems with Breathing Cracks, *International Journal of Mechanical Sciences* (2018), doi: <https://doi.org/10.1016/j.ijmecsci.2018.08.027>

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Highlights

- Breathing cracks are modeled as bilinear stiffness which is then incorporated into general FE models to establish for the first time the existence and the salient characteristics of higher-order FRFs;
- A very accurate and robust correlation technique is proposed and used to extract very accurately harmonic components present in overall nonlinear vibration responses which are usually orders of magnitudes smaller and are hence difficult to estimate using conventional FFT based signal processing;
- A crack detection and identification method is subsequently developed which has been shown to be reliable, accurate and robust in the presence of measurement uncertainties;
- Practicality and numerical performances of the proposed methods are demonstrated through extensive case studies based on a very general GARTEUR structure used in an Eurowide test/analysis correlation exercise.

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