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An Inverse Convolution Method for Source and Damage Detection in Periodic and Homogeneous Media

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In this paper, we present a new method for damage and source detection in periodic and homogeneous media. The proposed method is an extension of the INverse COnvolution MEthod (INCOME) [1,2], a wavenumber extraction technique published in the authors' previous works. To function, INCOME requires full-field measurements of the area/media of interest on a regular grid and in the frequency domain. For each frequency, a unitary convolution kernel is obtained as the solution of a linear least-squares minimization problem. The kernels encode information about the k-spaces of the media at their respective frequencies and also about sources/damage on the medium when their convolution product is taken with displacement field. Another avenue to source and damage detection consists in subtracting from the measured displacement fields their projection on the null-space of the convolution kernel thereby revealing the scattered fields which can be mathematically analyzed when the general form of the medium's Green's function is known. In this work, the aforementioned damage detection strategies are applied in simple experimental cases to illustrate the potential of INCOME.

REFERENCES

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