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Multiple Cracked Beam Modeling and Damage Detection using Frequency Response Function

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Summary

An efficient approach to identify multiple cracks in a slender beam using the frequency response function data is presented. It is formulated in a general form from the dynamic stiffness equation of motion for a structure and then applied to a slender beam. The cracks are modeled by rotational springs and the frequency response function is computed based on a spectral element model by the spectral finite element. The procedure gives a linear relationship explicitly between the changes of the measured frequency response function and crack parameters. The inverse problem is solved iteratively for the depths and locations of the cracks through the sensitivity-based model updating. Some numerically simulated tests on beam examples are provided for validating the feasibility of the method to identify the cracks. The results are generally agreement with the target values. Finally, the effect of noise on the damage identification is discussed in the numerical examples.