

Gapped Gaussian smoothing technique for debonding assessment with automatic thresholding

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© 2019 John Wiley & Sons, Ltd. Sandwich structures are subjected to imperfect bonding or debonding caused by defects during the manufacturing process, by fatigue, or by impact loads. In this context, their safety and functionality can be improved with the implementation of vibration-based structural damage assessment methodologies. These methodologies involve the computation of second or higher order displacement derivatives, which are often obtained using the central difference method. Nevertheless, this method propagates and amplifies the measurement errors and noise. Therefore, a Gaussian process (GP) regression model to build smoothed (noise-free) curvature mode shapes from noisy experimental mode shape displacements is presented in this paper. The proposed baseline-free debonding assessment approach combines the gapped smoothing (GS) method, curvature mode shapes estimated using a GP regression, and the valley-emphasis method to automatically find damaged regions. Experimental resu