EXTRACTION OF MODAL PARAMETERS FROM RESPONSE MEASUREMENTS

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ABSTRACT

The main objective of this paper is to perform a comparison of several curve-fitting methods for extraction of the modal parameters from response vibration measurements, and in particular the best damping estimates. Measurements were carried out on a steel beam to which a constrained layer had been added to make the damping more similar to that of vehicle structural components. Two shakers with different excitation signals, a periodic impulsive and a random signal, respectively, excited the structure, but after separation, only the random part was analysed for the results of this paper. This study compares a number of common curve fitting methods, viz: The Rational Fraction Polynomial Method, the Complex Exponential Method, the Complex Cepstrum Method, the Hilbert Envelope Method and the Ibrahim Time Domain method. The most accurate results for detection of the damping and natural frequencies were obtained by using the Ibrahim Time Domain method, with the Rational Fraction Polynomial method very similar. The Hilbert Envelope method gave comparable damping estimates. The Cepstrum and Complex Exponential methods gave reasonable results for the frequencies, but not for the damping.

Keywords: Rational Fraction Polynomial, Complex Exponential, Complex Cepstrum, Hilbert Envelope and Ibrahim Time Domain Method.