

ESTIMATION OF NONPROPORTIONAL DAMPING FROM EXPERIMENTAL MEASUREMENTS

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ABSTRACT

The full modal damping matrix (both diagonal and off-diagonal terms) is required to synthesize the modal damping of a structural system from substructure tests, and may be used to estimate the distribution of damping in a structure.

A method for determining a full modal damping matrix from experimental measurements was published by the first author in 1972. The method was applied with limited success, the problem being that complex modes were very difficult to obtain from the analog sine-dwell modal test data which were available at the time. Since then, several modal identification methods have been developed which derive complex modes from digitally recorded and processed vibration test data. Only the real parts of these complex modes are used, however; the small imaginary parts so far have been ignored.

This paper presents methods which have been developed to condition the experimental complex mode data obtained by the ERA method for purposes of estimating the full modal damping matrix. Practical application of these methods using experimental data from truss-beam type structures are presented.

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