

Modeling of Structural-Acoustic Interaction Using Coupled Fe/Be Method and Control of Interior Acoustic Pressure Using Piezoelectric Actuators (Paperback)



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Reviews


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(Harold Spencer)

MODELING OF STRUCTURAL-ACOUSTIC INTERACTION USING COUPLED FE/BE METHOD AND CONTROL OF INTERIOR ACOUSTIC PRESSURE USING PIEZOELECTRIC ACTUATORS (PAPERBACK)



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Independently Published, United States, 2018. Paperback. Condition: New. Language: English. Brand new Book. A coupled finite element (FE) and boundary element (BE) approach is presented to model full coupled structural/acoustic/piezoelectric systems. The dual reciprocity boundary element method is used so that the natural frequencies and mode shapes of the coupled system can be obtained, and to extend this approach to time dependent problems. The boundary element method is applied to interior acoustic domains, and the results are very accurate when compared with limited exact solutions. Structural-acoustic problems are then analyzed with the coupled finite element/boundary element method, where the finite element method models the structural domain and the boundary element method models the acoustic domain. Results for a system consisting of an isotropic panel and a cubic cavity are in good agreement with exact solutions and experiment data. The response of a composite panel backed cavity is then obtained. The results show that the mass and stiffness of piezoelectric layers have to be considered. The coupled finite element and boundary element equations are transformed into modal coordinates, which is more convenient for transient excitation. Several transient problems are solved based on this formulation. Two control designs, a linear quadratic regulator (LQR) and a feedforward controller, are applied to reduce the acoustic pressure inside the cavity based on the equations in modal coordinates. The results indicate that both controllers can reduce the interior acoustic pressure and the plate deflection. Mei, Chuh and Shi, Yacheng Langley Research Center BOUNDARY ELEMENT METHOD; FINITE ELEMENT METHOD; ACOUSTIC PROPAGATION; FEEDFORWARD CONTROL; LINEAR QUADRATIC REGULATOR; SOUND PRESSURE; PRESSURE REDUCTION; COMPOSITE STRUCTURES; TIME DEPENDENCE; RESONANT FREQUENCIES; VIBRATION MODE; CONSTITUTIVE EQUATIONS; PIEZOELECTRICITY; ACTUATORS; CAVITIES; ISOTROPY; PANELS; MATHEMATICAL MODELS; PRESSURE DISTRIBUTION; COMPOSITE MATERIALS; INTERLAYERS; INTERACTIONS.

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