Method of Fundamental Solutions for the Vibroacoustic Analysis

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The method of fundamental solutions, one of the promising boundary-type meshless methods, is proposed as a direct procedure to formulate and analyze the vibroacoustic problem. The coupled system discussed in this study is composed of an acoustic-cavity and excited by an external force or an internal sound source harmonically. The wall of cavity is composed of the beam or the plate components, respectively, in two- and three-dimensional problems. The two independent sub-systems interact at the interface simultaneously by satisfying the necessary equilibrium and compatibility conditions. The mathematical formulations described by the presented meshless method straightforwardly enable us to investigate the frequency responses of the vibroacoustic problem with no boundary integrals. General characteristics of the dynamic coupling effect are displayed, based on the systematic natural frequencies and mode shapes. Feasible results simulated by the presented numerical scheme are validated through numerical experiments including the acoustic-wave propagation problems and the vibroacoustic problems.

Keywords: method of fundamental solutions, vibroacoustic, natural frequency, mode shape, acoustic-wave propagation.