FSM1S_12691

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Distributed Parameter Control of a 2D Acoustic Helmholtz Problem on a Halfspace

George Biros[(1)], Seong-Won Na[(2)], Loukas F. Kallivokas[(2)]

(1) *Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania, Philadelphia, USA*
(2) *Department of Civil Engineering, The University of Texas at Austin, Austin, USA*

In this work we present the formulation and numerical solution of a distributed parameter control problem for the acoustic equation in a halfspace with potential applications to the seismic insulation of surficial structures. We consider the case of SH-waves in a two-dimensional materially inhomogeneous halfspace. The goal is to invert for the necessary material injections in a pre-selected region near the free surface so that, for a range of excitation frequencies of an incoming disturbance, the displacement response on the free surface is constrained below a threshold value. We use an infinite-dimensional constrained optimization formulation, in which the constraints are given by a set of (uncoupled) Helmholtz problems corresponding to a range of excitation frequencies. The Helmholtz problems are discretized using a finite element formulation on a half disk with absorbing boundary conditions prescribed over the truncation boundary. We use a Lagrange-Newton-Krylov-Schur algorithm (LNKS) to solve the system of nonlinear PDEs that correspond to the first-order necessary optimality conditions. We present the formulation and numerical results.

View the extended summary