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A mixed u/p finite element formulation for acoustic-porous-structure interaction system

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This research aims to develop a new unified analysis approach for acoustic-porous-structure multiphysics interaction system in the framework of a mixed **u**/*p* finite element (FE) formulation. The multiphysics analysis of acoustic structure interaction is performed by solving the linear elasticity equation and the Helmholtz equation separately with the so-called coupling boundary condition. If the pressure attenuation from a porous material is additionally considered, the multiphysics analysis of acoustic-porous-structure interaction becomes very intricate as the three different media with the different governing equations as well as the interaction boundary conditions for acoustic, porous and elastic structure should be properly formulated. To simply it, we propose to apply a mixed **u**/*p* formulation to consider the mutual coupling effects among acoustic medium, fibrous medium. By combining the mixed FE formulation with the empirical Delany-Bazley formulation, the multiphysics simulation of the sound propagation considering the coupling effects among the three media can be performed.

Keywords: acoustic-porous-structure interaction, Delany-Bazley model, acoustic analysis, porous material, empirical material model