Title: Porous-elastic multilayered shell element

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Abstract

A new ZPST multilayered shell element including a porous-elastic layer is presented in this paper. This shell element adapted to several industrial applications is aimed to reduce the meshing and numerical costs associated with 3D finite element models usually employed with porous materials. The solid displacement and the fluid pressure are interpolated with a polynomial and a zig-zag function in the thickness. The classical Biot's model is then used in the porous-elastic layer, and standard coupling conditions are imposed between elastic and porous-elastic layers. Due to the frequency dependency of the viscous and thermal effects in the porous domain, the modal method is not appropriate and a method based on Padé Approximant is used instead.

This method enables to achieve fast frequency sweep computations compared to a standard direct method. Finally, successful numerical validations are presented.