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Study of a vibroacoustic interior problem with viscoelastic sandwich structure using the Asymptotic Numerical Method

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The aim of this study is to compute the eigenvalues of a vibroacoustic interior problem with fluid-structure coupling.

A displacement-pressure formulation is chosen to modelize the problem. Then, the spatial discretisation with the finite element method leads to a non symmetric and poorly conditioned matrix system.

It is proposed to solve this discretized system with the Asymptotic Numerical Method (ANM). This method associates a high order perturbation method to a continuation technique [1]. Thus, the initial nonlinear problem is linearized and a set of linear algebraic systems easier to solve is obtained.

The proposed method is validated with numerical tests on a conservative problem (that is to say for an elastic structure).These tests show that the computational times required with this method are lower than those needed with an Arnoldi-based method. Moreover our method is not sensitive to poorly conditioned matrix, so there is no need to add a preconditioning step [2].

Once the conservative problem is solved, the corresponding solutions are used as initial values to solve the associated dissipative problem (that is to say a viscoelastic sandwich structure [3]). Numerical developments are ongoing to evaluate the method coupling the homotopy to the ANM, and results are expected for the conference.

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