FLUID STRUCTURE INTERACTIONS

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Fluid-structure vibrations occur in various situations, in aerospace, automotive, civil engineering areas as well as in biomechanics.
The computational aspects concerning the linear vibratory response of fluid-structure systems to prescribed loads may lead, for complex structures, to a prohibitive number of degrees of freedom. In order to quantify the weak or strong interactions of the coupled fluid-structure system, in order to carry out sensitivity analysis, in order to introduce interface appropriate active/passive damping treatment (intelligent adaptive fluid-structure systems), reduced order procedures are required. That is why concepts which have been introduced for structural dynamics, such as component mode synthesis (CMS), are presently revisited and adapted to some multiphysic problems.
We review in this presentation reduced order models for modal analysis of elastic structures containing an inviscid fluid (gas or liquid). These methods, based on Ritz-Galerkin projection using appropriate Ritz vectors, allow us to construct reduced models expressed in terms of physical displacement vector field in the structure, and generalized displacement vector describing the behaviour of the fluid.
Various aerospace applications are presented.

Book : H. Morand and R. Ohayon – Fluid Structure Interaction – Wiley – 1995

Chapter of an Encyclopedia : R. Ohayon – Fluid Structure Interaction – Encyclopedia of Computational Mechanics (edts. E. Stein, T. Hughes, R. de Borst) – Wiley - 2004