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# INTELLIGENT ADAPTIVE FLUID-STRUCTURE INTERACTION SYSTEMS

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**Summary:** It is proposed to investigate, from predictive computational point of view – finite element discretization, reduced order models - the dynamic behaviour of complex coupled systems and their adaptive intelligent treatment of interfaces for vibration and noise reduction of interior fluid-structure interactions problems, such as liquid-structure and/or structural-acoustics.

The applications may be found for example, in aerospace engineering such as liquid propelled launchers for the attenuation of the vibrations of liquids in tanks, the attenuation of noise in fairings for the satellites as well as attenuation of noise in fuselage cabin of aircrafts or helicopters.

The domain of frequency is of prime interest and we must distinguish the three domains low-medium and high frequency range.

In this presentation, we will not consider the high frequency domain for which specialozed methodology should apply as statistical energy analysis.

The smart structural treatments considered here are those in the low and medium frequency ranges.

In parallel of direct symmetric variational formulations/numerical finite elements for modal analysis of fluid-structure interior vibrations, the construction of a family of appropriate reduced order models, especially for the fluid part, as done in structural dynamics by substructuring is of prime importance for sensitivity analysis, multidisciplinary optimization, updating with experiments as well as smart structural treatments such as active/passive vibration reduction treatments of those systems for their control (as an example let us cite the modelling of <vibration and noise devices > acting as physical interfaces such as viscoelastic/piezoelectric layers).

A distinction should be clearly made between gas and liquids taking into account incompressibility/compressibility as well as light fluids/ heavy fluids considerations with gravity effects.

The purpose of this presentation will be to give a review synthesis of those aspects and perspectives. Below we give some local references (see also the website www.lmssc.cnam.fr).

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