

Recent Advances in Fluid-Structure Interaction Modeling for Engineering Applications

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The focus of this talk is to share recent numerical developments and applications of new techniques such as Combined Interface Boundary Conditions (CIBC), Non-linear Iterative Force Correction (NIFC) and One-Field Finite Element. The proposed new schemes are assessed with increasing complexity of problems of flexible flapping dynamics and strong added-mass effects. The target applications involve in offshore vortex-induced vibrations and aeroelastic flapping dynamics. In this talk we will also present further theoretical investigation of added mass and aeroelastic instability of an elastic plate with uniform mean flow. In particular, we note that the added-mass effect for incompressible flow has a global character, and for compressible flow the effect of the displacement of interface on the fluid is limited to a region along the interface and the added mass term is time dependent. This has a strong implication in the design and construction of iterative fluid-structure interaction techniques.

Keywords: Interface conditions, iterative force correction, one-field finite element, strong added-mass, aeroelastic instability.