Striving for ACES solutions to complex systems: fluid dynamics, fluid-structure interactions, and multiphysics coupling

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Abstract

Being well-trained and equipped with solid capabilities, ACES members have striven for “ACES solutions” for years, not only in academic and fundamental numerical method developments, but also the practical engineering practical problems for industry. This presentation will take a glance into the efforts made by ACES members in the fields of fluid dynamics, fluid-structure interactions, and multiphysics coupling in the past years.

Brief summary and review on the numerical methods developments will be introduced. The W2 theory has built up the foundation of numbers of numerical methods, such as the family of smoothed point interpolation method (including LC-PIM, CS-PIM, NS-PIM and so on), the family of Smoothed Finite Element Methods (including NS-FEM, ES-FEM, α-FEM and so on), Gradient Smoothing Method (GSM) for computational fluid dynamics, Immersed Smoothed Finite Element Method (IS-FEM) for fluid-structure interactions and so on. These methods have been widely used in various academic researches and engineering applications such as, statics and dynamics analysis of linear and nonlinear solids, membrane and shell structures, sound and noise analysis, thermal analysis, crack analysis, CFD simulations, fluid-structure interactions in engineering and biological systems, multiphysics problems such as electrostatics-fluid-solid coupling problems.

Challenging problems of complex industrial systems solved by ACES members and their collaborators will be exhibited to show the arts and power of the numerical simulations.