

A High End Digital Prototyping System for Combustion Modeling

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This presentation outlines a virtual prototyping system for propulsion modeling, and focuses on current enabling technologies for large-scale multidisciplinary simulations. Enabling technologies are those technologies preparing input data, analyzing output data and facilitating the whole processes for numerical simulations. The current software is a collaboration software environment equipped with capability of parallel mesh generation, large-scale visualization and parallel computation. In the system, there are four categories of modules involved, namely pre-processing module, computing module, post-processing module, and platform control module. All these modules are coupled through a software bus, which makes the modules integrated seamlessly.

The tool used for prediction and understanding of combustion mechanisms is a parallel CFD solver, featured using full compressible Navier-Stokes equations with finite-rate chemistry reaction. Accurate turbulent combustion interaction and spray models are to be considered. Two examples addressed are for modeling HyShot scramjet combustion and Lean-Direct Injection (LDI) combustion.

Keywords: Digital prototyping system, Collaboration software environment, Combustion modeling, HyShot scramjet combustion, Lean-Direct Injection combustion.