Applications of High Performance Computing in Acoustics

Utilize High Performance Computing for Flow-induced Vibration and Sound Predictions

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Flow-induced vibration and sound is one of the major design considerations in moving vehicles. To understand and examine the leading sources of vibration and sound, it requires knowledge of various disciplines (hydro-/aero- dynamics, structural dynamics, and acoustics) and their interactions. This talk specifically focuses on the fluid-structure interaction (FSI) of structures subjected to turbulent boundary layer (TBL) excitations.

A quick survey of various approaches in describing the TBL forcing functions will be presented; then followed by advanced numerical techniques in efficiently predicting structural transfer functions. Finally block pressure assumption is utilized to analyze the structural and acoustic responses by combining the TBL forcing functions with the structural transfer functions.

As computational resources are getting more powerful and accessible, a model of a flat plate under the TBL excitations is used to demonstrate how high performance computing (HPC) can be utilized to support fluid-structure interaction analysis, shorten its overall turn-around time, and support design optimization.

*Keywords: HPC; h*igh performance computing; TBL; turbulent boundary layer; FSI; fluid-structure interaction.

References

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