MECHANICAL ENGINEERING STUDENT SEMINAR

Monday, August 21, 2024, at 13:30, D. Dan and Betty Kahn Building, Auditorium 1.
Online: ttps://technion.zoom.us/j/98776485464

Understanding Supersonic Jet Noise using High-Fidelity GPU-Accelerated Numerical Simulations

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Accurate simulations of high-speed flows require high-resolution numerical algorithms. This study developed a class of new high-order numerical schemes and a GPU-accelerated solver to solve the compressible Navier-Stokes equations on curvilinear geometries, including dynamically deforming meshes. Schemes of 4th and 6th order accuracy were derived with controllable spectral properties by parametrizing the truncation error of the numerical scheme. An optimization process is proposed to adjust the spectral properties of the numerical schemes for minimal dispersion and dissipation error. Benchmark tests, including unsteady 3D flow cases, demonstrated improvements in solution accuracy, stability, and reduced grid resolution requirements. The parallelizability of these schemes was showcased by running simulations on multiple GPUs simultaneously, employing grids with up to 200 million degrees of freedom. These numerical algorithms were also applied to study supersonic jet noise, focusing on the effects of jet temperature ratio and impingement wall curvature. Further details on these results will be discussed in the presentation.

Keywords: Numerical methods, GPUs, supersonic jet noise

Note: the seminar will be given in English

Seminars Coordinator: Assoc. Prof. Shmuel Gal.