

Gridding complex geometries for spectral element method simulations

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Despite very successful complex geometry calculations using Nek over the years, gridding complex geometry cases remains a challenge. I will present some recent complex geometry cases using Nek and discuss possible new methodologies to simplify the gridding process. First, h-p adaptivity can be used to develop a suitable grid, starting from a fairly coarse mesh. However, the dynamic adaptive process quickly leads to imbalances in large scale computing. A load balancing algorithm for the hp-adaptive process will be presented along with scaling tests on both CPUs and GPUs. I will also discuss the treatment of curvilinear geometries using splines, mappings and immersed boundaries and compare results and efficiencies.

Relevance for Nek [100 words max]

The work presented includes simulations using Nek and NekRS. Further, I am interested in improving grids and grid efficiency for complex geometry flows simulated by Nek. Evaluations of some methodologies for treating complex geometry grids within the spectral element framework of Nek (or future Nek versions) will be presented.

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