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Algorithmic grid selection in LES[1] SIAVASH TOOSI, JOHAN LARSSON, University of Maryland, IVAN BERMEJO-MORENO, University of Southern California — Given the recent progress in LES modeling and numerical schemes the computational grid has now become the single most important factor determining the quality of an LES; and yet the current state-of-the-art is to rely fully on user expertise to build the grid. While this is a workable process for academic problems in relatively simple geometries, it becomes untenable going forward towards more complex flows in complex geometries with multi-physics effects at increasing computational scales. The present work is aimed at developing an algorithmic process for how to select a nearly optimal grid (maximal accuracy at minimal cost) for LES. Two error indicators are used to drive an iterative grid selection process, where the solution from a previous LES run is used to select a more optimal grid for a subsequent run. The resulting method is highly systematic, with minimal dependence on user input, and can be operated both in a free mode that results in unstructured grids and in a constrained mode that results in structured grids. The process is tested on a variety of test cases, including wall-resolved and wall-modeled LES of both canonical flows (channels and boundary layers) and more complex flows (backward-facing step and smooth-body separation) with excellent results in all cases.

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