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A Strategy to Reduce Numerical Oscillations by Aggressive Grid Stretching HAOSEN XU, XIANG YANG, Stanford University — Unphysical numerical oscillations arise in CFD calculations where central difference schemes are used along with coarse grids. Often used remedies for such unphysical oscillations include filtering, upwind schemes and grid stretching/compression. While the former two approaches are known to be overly dissipative, the latter can many times be expensive. In this work, we attempt to find an optimal mesh deployment. While it is conventional acknowledged that more grid points are to be used in regions where unphysical numerical oscillations are detected, our approach requires only one single refined grid in regions where drastic acceleration/deceleration occurs, and numerical oscillations in the bulk region are suppressed without further mesh refinements there. The proposed grid stretching strategy is then tested in several flow configurations, including two- and three-dimensional lid driven cavity, flow passing wall-mounted cubes, flow passing two-/three-dimensional objects. Two-grid-spacing oscillations are found to be substantially suppressed in all cases. Possible use of this strategy may be in adaptive-mesh-refinement, where nowadays more grid points are immediately used wherever the spatial gradients of, e.g., velocity is large.

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