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ADAPTIVE GRID REFINEMENT USING THE GENERALISED FINITE-DIFFERENCE METHOD

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The combination of the generalised finite-difference method (GFDM) and adaptive grid refinement is applied to solve two-dimensional fluid flow problems. The accuracy of this combination is demonstrated by solving the two-dimensional lid-driven cavity flow and two-dimensional backward-facing step flow problems, and comparing the results against the benchmarks. This new computational fluid dynamics (CFD) formulation is applied to solve a two-dimensional meter flow application to determine the velocity profiles through the centre of the meter for higher Reynolds numbers.

To verify the accuracy of this combination, analytical two-dimensional and three-dimensional Laplace partial differential equations are solved by two methods. The first method uses the finite-difference method (FDM) over a uniform grid of nodes, and the second method uses the GFDM over a nonuniform grid of nodes. Computational cost and accuracy comparisons are made for both methods.

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