

Load balanced 2D and 3D Adaptive Mesh Refinement in OpenFOAM

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Local dynamic Adaptive Mesh Refinement (AMR) reduces computational costs for problems with a transient local demand of high resolution by dynamically adapting the cell size to accuracy requirements. In parallel distributed cases Dynamic Load Balancing (DLB) complements AMR to avoid bottlenecks due to the dynamically changing resource demand on each processor.

Enhancements to the AMR algorithm by adding flexible multi-criteria refinement as well as AMR for two-dimensional and axisymmetric cases based on the work of Baniabedlurhman (2015) are presented. Several issues regarding the addressing of cell-faces and interpolation of surface fields are resolved to improve and stabilize run-time performance.

Our improved AMR framework is complemented by DLB based on Voskuilen (2014), which has been further enhanced and made available for the latest OpenFOAM releases 4.x and 5.x. We demonstrate significant speed-up for several cases in 2D and 3D.

References

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