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A low-dissipation numerical scheme on Voronoi grids for complex geometries FRANK HAM, SANJEEB BOSE, BABAK HEJAZI, Cascade Technologies, VARUN MITTAL, Bosch RTC — The generation of high quality meshes in complex geometries suitable for multi-scale computations remains difficult and cumbersome. Inevitably, the lack of regularity, skewness, or other undesirable mesh features leads to compromises in the numerical scheme where either accuracy is sacrificed or dissipation is introduced. Reliance on scheme switching based on grid quality complicates grid convergence, especially when utilizing local refinement. We introduce an alternative strategy where the computational meshes are built from the Voronoi diagram of a prescribed point cloud. The use of the Voronoi diagram naturally leads to a mesh with inherent quality (e.g., alignment of face normals and site displacement vectors). Moreover, because the Voronoi diagram is defined uniquely from a set of points, mesh regularity can be achieved from either proper packing of the generating sites or by straightforward mesh smoothing. The efficiency (of both the diagram generation and solution), convergence, and solution quality will be illustrated using canonical and applied configurations.

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