Adaptive anisotropic mesh refinement based on a new adaptivity paradigm

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We propose a new paradigm for adaptive mesh refinement. Instead of considering local mesh diameters and their adaption to solution features, we propose to evaluate the benefit of possible refinements in a direct fashion, and to select the most profitable refinements. We demonstrate that based on this approach a directional refinement of triangular elements can be achieved, allowing arbitrarily high aspect ratios. With the help of an edge swapping criterion, even the mesh re-alignment with arbitrary error directions is achieved. Numerical experiments demonstrate the utility of the proposed anisotropic refinement strategy.

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