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Quality preserving polygonal mesh refinement algorithm for Virtual Element Methods

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In the talk the use of polygonal mesh refinement is discussed in order to tackle two common issues: first, adaptively refine a provided good quality polygonal mesh preserving quality, second, improve the quality of a coarse poor quality polygonal mesh during the refinement process on very complex domains.

A new refinement method for convex cells is presented with the aim of introducing some properties useful to tackle convergence and optimality for adaptive methods. The key issues in refining convex general polygons are: a refinement dependent only on the marked cells for refinement at each refinement step; a partial quality improvement, or, at least, a non degenerate quality of the mesh during the refinement iterations; a bound of the number of unknowns of the discrete problem with respect to the number of the cells in the mesh. Although these properties are quite common for refinement algorithms of triangular meshes, these issues are still open problems for polygonal meshes.

The adaptive strategy is applied to problems defined in very complex geometries where the starting mesh is obtained by a simple and coarse partition of the domain in convex subdomains. Preliminary results concerning new a posteriori error estimates will be introduced.

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