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MAS O MENOS: QUASI-OPTIMAL MESH GENERATION BY CONCURRENT REFINEMENT AND COARSENING USING THE VIRTUAL ELEMENT METHOD

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Abstract. The virtual element method (VEM) is a recent extension of the finite element method that permits arbitrary polygonal element geometry in two dimensions. This mesh flexibility means that the VEM is well-suited to problems involving adaptive mesh remeshing. In this work an energy error estimation has been implemented using a super-convergent patch recovery procedure. Using this error estimator elements are flagged for refinement or coarsening. The refinement (D van Huyssteen et al., *CMAME*, 393(1):114849 (2022)) and coarsening (D van Huyssteen et al., *CMAME*, 418(1):116507 (2024)) of the elements is performed using novel remeshing procedures that are suitable for the arbitrary polygonal element geometries permitted by the VEM. The combined remeshing procedure has been implemented for the case of two-dimensional linear elastic problems and represents the first example of a fully adaptive VEM (D van Huyssteen et al., *arXiv*, 2407.13665 (2024)). Of further significance is the novel notion of quasi-optimal meshes. A quasi-optimal mesh is that which meets a specified energy error target and exhibits quasi-even error distribution. That is, all element-level errors fall within a satisfactory range defined in terms of the specific target. Through the novel fully adaptive remeshing procedure elements are refined and coarsened accordingly until a quasi-even error distribution is met. The remeshing procedure is capable of generating a quasi-optimal mesh from any initial mesh and for any specified error target (D van Huyssteen et al., *arXiv*, 2407.13665 (2024)).

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