ANISOTROPIC MESH ADAPTATION FOR A TWO-DIMENSIONAL BRITTLE FRACTURE MODEL FOR THIN SHELLS

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Abstract

We focus on a two dimensional model for brittle fractures of thin elastic shells, subject to deformations in the normal direction.

In particular, we consider a two dimensional surface with a small thickness and model the brittle fracture energy in curvilinear coordinates by generalizing the model proposed by G.A. Francfort and J.-J. Marigò in [3], and by considering the case of vector fields orthogonal to the reference surface. Following the strategy of [2], we obtain our model as the Γ-limit as the thickness tends to zero.

In the next step, we adapt the well-known Ambrosio-Tortorelli approximation for the Francfort-Marigò functional to the new model. This allows us to compute numerical simulations of quasi static evolutions along critical points.

Finally, by generalizing the theory developed in [1], we introduce an anistropic mesh adaptation procedure to sharply capture the crack evolution. This approach allows us to considerably increase the efficiency of the discretization by avoiding any extra refinement in the areas where the material is sound, and by ensuring that the crack path is independent of the mesh.

References

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