Variational Models of Brittle Fracture: Analysis and Computation

Dr. Christoph Ortner

Oxford University Computing Labortarory

I will begin by reviewing a variational model of brittle fracture introduced by Francfort and Marigo (1998), explaining its successes as well as shortcomings. In particular, I will concentrate on a comparison to "classical" theories based on the development of Griffith's principles (1920): While the Francfort–Marigo model is based on the global minimization of an energy functional, Griffith's model can be understood in terms of the local minimization of the same functional.

A thorough analytical understanding of the variational model of brittle fracture is crucial for developing numerical approximation schemes. In the second half of the talk, I will present a numerical method based on the Ambrosio–Tortorelli Approximation, an idea related to phase field models. I will discuss the convergence of an adaptive finite element algorithm in the light of the analysis presented in the first half.