A new diffuse interface approach to brittle fracture VERONICA
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Strada Costiera 11, 34100 Trieste, Italy — We present a continuum model for the
propagation of cracks and fractures in brittle materials where *the full set of variables
are the components of the strain tensor ε*. The evolution equations are based on a
free energy that reduces to that of linear elasticity for small ε, and accounts for
cracks through energy saturation at large values of ε. We regularize the model
including terms dependent on gradients of ε in the free energy. No additional fields
are introduced, and then the whole dynamics is perfectly defined. We show that the
model is able to reproduce basic facts in fracture physics, like the Griffith's criterion.
In addition, regularization makes the results insensitive to the numerical mesh used,
something not at all trivial in crack modeling. This new technique presents a broad
spectrum of possibilities. We will show a non trivial applications for quasistatic
crack propagation in $2D$, the prediction of the growth and curving of cracks. The
model could be used to study the dynamics of cracks, as sound emission, cracks
instabilities and bifurcation, and it also could be extended to study problems in 3D.

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