Modeling of quasi-brittle damage in Fourier space.

Klaus Hackl[1], **Christoph Moos**[1]
[1] Lehrstuhl für Mechanik - Materialtheorie, Ruhr-Universität Bochum, Bochum Germany

We formulate a model for quasi-brittle damage combined with linear elastic behavior, where we use the effective stress concept, e.g. a damage factor $f(d)$ is introduced that locally reduces elastic stiffness. In order to prevent the ill-posedness which is typical for strain softening models, an additional field variable φ for regularization is introduced into the variational formulation, based on the ideas proposed in [2, 3]. A term including the gradient of φ is added, and variational analysis yields an algebraic and a Helmholtz-type equation for φ and d, respectively. A numerical algorithm based on the work of Moulinec and Suquet [1] empoying fast Fourier transform of the constitutive equations is introduced, which is time efficient, has a high potential for parallelization, and provides reasonable, mesh-independent results. The algorithm is demonstrated on several two and three dimensional examples.

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