Approximation of Rate-Independent Evolution with Non-Convex Energies

Christian Meyer[1,*], **Michael Sievers**[2]

[1]*Faculty for Mathematics, TU Dortmund, Germany*
[2]*Faculty for Mathematics, TU Dortmund, Germany*
[*]Email: `cmeyer@math.tu-dortmund.de`

Rate-independent systems governed by non-convex energies provide a several mathematical challenges. Since solutions may in general show discontinuities in time, the design of a suitable, mathematically rigorous notion of solution is all but clear and several different solution concepts exist, such as weak, differential, and global energetic solutions. In the recent past a new promising solution concept was developed, the so-called parametrized solution. The principal idea is to introduce an artificial time, in which the solution is continuous, and to interpret the physical time as a function of the artificial time. A numerical scheme that allows to approximate this class of solutions is the so-called local time-incremental minimization scheme. We investigate this scheme (combined with a standard finite element discretization in space) in detail, provide convergence results in the general case, and prove convergence rates for problems with (locally) convex energies. Numerical tests confirm our theoretical findings.