Separately global solutions to rate-independent systems - Applications to large-strain deformations of damageable solids

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Rate-independent systems (RIS) are characterized by the lack of any internal time length scale: rescaling the input of the system in time leads to the very same rescaling of its solution. In continuum mechanics, rate-independent models represent a reasonable approximation whenever the external conditions change slowly enough so that the system can always reach its equilibrium. This applies if inertial, viscous, and thermal effects are neglected. RIS have proven to be useful in modeling of hysteresis, phase transitions in solids, elastoplasticity, damage, or fracture in small and large strain regimes.

The talk introduces the notion of separately global solutions for RIS with non-convex functionals and describes an existence result for a model of bulk damage at large strains. The analysis covers non-convex energies blowing up for extreme compression, yields solutions excluding interpenetration of matter, and allows for handling nonlinear couplings of the deformation and the internal variable, which emerges e.g. from the interplay between Eulerian and Lagrangian description. It extends the theory developed so far in the small strain setting.