Non-smooth Newton methods for the Cahn-Hilliard equation with obstacle potential

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We consider preconditioned Uzawa iterations for a saddle point problem with inequality constraints as arising from implicit time discretization of the Cahn-Hilliard equation with obstacle potential. We present a new class of preconditioners based on linear Schur complements associated with successive approximations of the coincidence set. A convergence proof of the resulting iterative scheme is based on its reintepretation as a non-smooth Newton method for the nonlinear Schur complement. As expected from our theoretical findings we found superlinear convergence and finite termination in numerical experiments.

This is a joint work with Carsten Graeser (FU Berlin).