Fast solvers for Cahn-Hilliard inpainting

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Abstract

We consider the efficient solution of the modified Cahn-Hilliard equation for binary image inpainting using convexity splitting which allows an unconditionally gradient stable time-discretization scheme. We look at a double-well as well as a double obstacle potential. For the latter we get a non-linear system for which we apply a semi-smooth Newton method combined with a Moreau-Yosida regularization technique. At the heart of both methods lies the solution of large and sparse linear systems. We introduce and study block-triangular preconditioners using an efficient and cheap Schur complement approximation. Numerical results indicate that our preconditioners work very well for both problems and show that qualitatively better results can be obtained using the double obstacle potential.

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