Robust a posteriori estimates for the stochastic Cahn-Hilliard equation
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We discuss a posteriori error estimates for a fully discrete finite element approximation of the stochastic Cahn-Hilliard equation with additive space-time noise.
The a posteriori bound is obtained by a splitting of the equation into a linear stochastic partial differential equation and a nonlinear random partial differential equation and treating the respective problems separately.
The resulting estimate is robust with respect to the interfacial width parameter as well as the noise intensity. Due to the lack of a stochastic counterpart of the principal eigenvalue problem for the linearized Cahn-Hilliard equation, the existing results on robust estimates for the stochastic Cahn-Hilliard equation were limited to the case of asymptotically small noise. We overcome this issue by using the principal eigenvalue of the Cahn-Hilliard operator linearized at the discrete solution.
This approach overcomes the small noise restriction and makes the resulting estimate computable. We illustrate the theoretical result by numerical simulations.