An augmented SAV scheme for the stochastic Allen-Cahn equation

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The scalar auxiliary variable (SAV) method was originally introduced in [Shen, Xu, Yang, J. Comput. Phys., 2018] for the discretization of deterministic gradient flows. By introducing an additional scalar auxiliary variable, they were able to formulate linear numerical schemes that are still unconditionally stable with respect to a modified energy.

This talk addresses the application of the SAV method to nonlinear stochastic partial differential equations with multiplicative noise.

Using the stochastic Allen-Cahn equation as a prototype problem, we motivate why a straightforward application of the SAV method will not provide satisfactory results and present an augmented SAV method that remedies the shortcomings and allows for a rigorous convergence proof.

We conclude by presenting numerical simulations which underline the practicality of the scheme and the importance of the introduced augmentation terms.