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Regularization techniques for backward–in–time evolutionary PDE problems JONATHAN GUSTAFSSON, BARTOSZ PROTAS, McMaster University — Backward–in–time evolutionary PDE problems have applications in the recently–proposed retrograde data assimilation. We consider the terminal value problem for the Kuramoto–Sivashinsky equation (KSE) in a 1D periodic domain as our model system. The KSE, proposed as a model for interfacial and combustion phenomena, is also often adopted as a toy model for hydrodynamic turbulence because of its multiscale and chaotic dynamics. Backward–in–time problems are typical examples of ill-posed problem, where disturbances are amplified exponentially during the backward march. Regularization is required to solve such problems efficiently and we consider approaches in which the original ill–posed problem is approximated with a less ill–posed problem obtained by adding a regularization term to the original equation. While such techniques are relatively well–understood for linear problems, they less understood in the present nonlinear setting. We consider regularization terms with fixed magnitudes and also explore a novel approach in which these magnitudes are adapted dynamically using simple concepts from the Control Theory.

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