Phase conditions, symmetries, and PDE continuation

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Abstract

Integral phase conditions were first suggested by E.J. Doedel as an efficient tool for computing periodic orbits in dynamical systems. In general, phase conditions help in eliminating continuous symmetries as well as in reducing the effort for adaptive meshes during continuation. In this talk we discuss the usefulness of phase conditions for the numerical analysis of finite- and infinite-dimensional dynamical systems that have continuous symmetries. The general approach, called the *freezing method*, will be presented in an abstract framework for evolution equations that are equivariant with respect to the action of a (not necessarily compact) Lie group. We show particular applications of phase conditions to time integration of equivariant PDEs that have relative equilibria or relative periodic orbits. Examples are provided by excitable reaction diffusion equations that exhibit traveling or rotating waves in one, rotating or meandering spiral waves in two, and scroll waves in three space dimensions.

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