

Center Manifold Method for Stability Analysis on nonlinear Kortweg-deVries Systems

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Abstract

Center manifold method has been a very powerful approach in studying stability of nonlinear ordinary differential equation (ODE) systems for a long time. And it has also proved to be useful in studying the stability of partial differential equation (PDE) systems. Through the center manifold method, we conduct stability analysis on an initial-boundary-value problem of a nonlinear Korteweg-de Vries equation posed on a finite interval $(0, 2\pi\sqrt{7/3})$. The system comes with a Dirichlet boundary condition at the left end-point and both of the Dirichlet and Neumann homogeneous boundary conditions at the right end-point. It is known that the associated linearized KdV problem around the origin is not asymptotically stable. In this paper, the nonlinear system is proved to be locally asymptotically stable around the origin through the center manifold method.