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BIFURCATIONS OF SOLITARY WAVES IN A COUPLED SYSTEM OF LONG AND SHORT WAVES

We consider families of solitary waves in the Korteweg–de Vries (KdV) equation coupled with the linear Schrödinger (LS) equation. This model has been used to describe interactions between long and short waves. To get a comprehensive characterization of solitary waves, we consider a sequence of local (pitchfork) bifurcations of coupled solitary waves from the uncoupled KdV solitons. The first member of the sequence is the KdV soliton coupled with the ground state of the LS equation, which is proven to be the constrained minimizer of energy for fixed mass and momentum. The other members of the sequence are the KdV soliton coupled with the excited states of the LS equation. We connect the first two bifurcations with the exact solutions of the KdV–LS system frequently used in the literature.