Flash Presentation

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Interests

My interests are:

1. KdV and NLS;
2. Long-term and Asymptotic Behavior of Solutions;
3. Soliton Stability;
4. Low-Regularity Dynamics; and
5. Also, elliptic equations; particularly, regularity issues for free boundary problems.

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Recent Results, 1

With Pigott in CPAA 2017, we consider the KdV equation:

$$\begin{cases} \partial_t u + \partial_x^3 u + \partial_x(u^2) = 0, \\ u(0,x) = u_0(x), \end{cases} \tag{0.1}$$

and soliton solutions thereof. We are able to prove that, in an exponentially weighted version of H^s, $\frac{7}{8} < s < 1$, solutions are exponentially stable for arbitrarily long finite times.

Recent Results, 2

Consider a generalized nonlinear Schrödinger equation as follows:

$$-\Delta u + V(|x|)u - \mathcal{N}(u) = -Eu, \tag{0.2}$$

with the external potential V a solution of

$$\Delta V = \rho(|x|) \tag{0.3}$$

for $\rho > 0$, $\|\rho\|_{L^1} = Z$.

Recent Results 2, ctd.

With Marzuola and Simpson in SIADS, 2017, we prove the following:

1. Existence of branches of radial solutions to our system. The number of zero crossings in the radial coordinate is invariant along each branch. At mass zero, the branches terminate in the eigenstates of the linear operator.
2. None of the branches intersect.
3. These branches, should they continue all the way to $E \to \infty$, connect to solutions of (0.2) with $V = 0$.
4. We also examine the stability of the bound states, both through a numerical examination of the spectrum, and through time dependent simulations. The ground state is orbitally stable, while the excited states, of large E, are linearly unstable.

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