On the Hamiltonian–Krein instability index

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Abstract. Spectral problems of the form

$$Lu = z\,Ju, \qquad z \in \mathbb{C}, \tag{1}$$

where $L = L^*$ is a lower semibounded self-adjoint operator and $J = J^* = J^{-1}$ is a self-adjoint unitary operator in a Hilbert space $\mathfrak{H}$ naturally appear in the study of various important nonlinear equations. If L has a nonempty negative spectrum, then it turns out that (1) might have nonreal eigenvalues and also real eigenvalues with Jordan chains of lengths more than 2. The number of those eigenvalues is usually referred to as *the instability index* κ_{Ham}. The instability index plays a crucial role in the study of spectral and orbital stability of nonlinear waves and it turns out that it can be computed in terms of certain spectral characteristics of L. In the first talk, we plan to overview the classical approach to investigate the instability index based on the Pontryagin invariant subspace theorem. In the second talk, we plan to show how to extend the classical approach to the case when the operator J is unbounded.

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