Determination of Resonances by the Optimized Spectral Approach

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Spectral approach consists in representing a trial solution of the differential equation as a linear combinations of the basis functions. Under the name of the Rayleigh-Ritz, the procedure is popularly used in determining bound-state solutions of quantum-mechanical Schrödinger problems. Several ways of extending this approach to the determination of resonance states have been considered in the literature. Here we propose the application of the optimized Rayleigh-Ritz method to this end. The method consists in introducing nonlinear parameters into the basis functions and fixing their values so as to make the trace of the variational matrix stationary. We show that the optimized Rayleigh-Ritz scheme with complex parameters provides an effective algorithm for the determination of resonance energies and widths for particles trapped in various potentials. The obtained convergence rate compares favorably to other approaches.

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