Eigenvalue excluding for 1D Schrödinger operators and related topics

Kaori Nagatou
Institute of Mathematics for Industry, Kyushu University
744 Motooka, Nishi-ku, Fukuoka 819-0395, Japan

Abstract

Subject of investigation in this talk is a 1D-Schrödinger equation, where the potential is a sum of a periodic function and a perturbation decaying at $\pm\infty$. It is well known that the essential spectrum consists of spectral bands, and that there may or may not be additional eigenvalues below the lowest band or in the gaps between the bands. We propose a method which is able to *exclude* eigenvalues in spectral gaps, i.e. which identifies sub -regions (of a gap) which contain no eigenvalues. It makes heavy use of computer assistance; nevertheless, the results are completely rigorous in the strict mathematical sense, since all computational errors are taken into account. In our method enclosing the corresponding fundamental solutions is needed and such an enclosure method is also presented. Moreover the enclosures for the fundamental solutions also play an important role in a ground state proof for a nonlinear Schrödinger equation and this topic will be also introduced.