Computer-assisted Proofs and Eigenvalue Bounds

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Abstract
In this talk a computer-assisted method for nonlinear elliptic boundary value problems, which gives not only the existence and local uniqueness of solutions, but also an enclosure of these, is presented. We consider a weak formulation of second-order differential equations in divergence form with Dirichlet boundary conditions. To apply this method, bounds to the essential spectrum and to isolated eigenvalues of some self-adjoint operator have to be computed. In the lecture we focus on the computation of such eigenvalue bounds, i.e. upper and lower bounds forming sharp enclosures for the eigenvalues. For this purpose, theorems for eigenvalue problems with bilinear forms are presented. Some simple examples illustrate the results.