

A Rational Approximation Method for Large-Scale Nonlinear Eigenvalue Problems

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Abstract

Eigenvalue problems in which the coefficient matrices depend nonlinearly on the eigenvalues arise in a variety of applications in science and engineering, e.g., dynamic analysis of structures or computational nanoelectronics, to mention just a few. This talk will discuss how the Cauchy integral-based approaches combined with rational approximation offer an attractive framework to develop highly efficient and flexible techniques for solving large-scale nonlinear eigenvalue problems. The main idea is to approximate the functions involved in the eigenvalue problem by rational functions and then apply a linearization. A few different schemes are proposed to solve the resulting linear eigenvalue problem by exploiting the special structure of the underlying linearization.

This is a joint work with M. El-Guide and Y. Saad.

Keywords: nonlinear eigenvalue problem, rational approximation, Cauchy integral formula, shift-and-invert projection method