The Nonlinear Eigenvalue Problem

Given a matrix-valued function $F$ which depends nonlinearly on a scalar parameter $z$, the basic nonlinear eigenvalue problem consists of finding those $z$ for which $F(z)$ is singular. Such problems arise in many areas of computational science and engineering, including acoustics, control theory, fluid mechanics, and structural engineering.

In this lecture I will give an introduction to nonlinear eigenvalue problems and some of their interesting mathematical properties. I will discuss and relate various classes of algorithms for their solution.