Induced Dimension Reduction method to solve the Quadratic Eigenvalue Problem

Reinaldo Astudillo

PhD student at TU Delft, The Netherlands

February 2, 2015

The Induced Dimension Reduction method (IDR(s)) was originally proposed for solving systems of linear equations, and recently adapted to solve the standard eigenvalue problem. In this talk, I am going to present an extension of IDR(s) to solve the Quadratic Eigenvalue Problem (QEP)

$$(\lambda^2 M + \lambda D + K)\mathbf{x} = \mathbf{0},$$

where M, D, and K are given matrices of order n. Using the short-recurrences formulas of IDR, we obtain a Hessenberg decomposition to approximate eigenvalues and eigenvectors of the linearized QEP. Also, exploiting the structure of the Krylov subspace vectors, we reduced the memory consumption of the proposed algorithm in almost a half. Numerical results generated by IDR for QEP are competitive with respect to others specialized algorithms like Second Order Arnoldi or Quadratic Arnoldi.