0.1 Eigen systems, Chapter 4, Section 1

Gerschgorin's theorem can be used to analyze the stability of the eigenproblem and for simply bounding the eigenvalues. For example, you can use it to show that the matrix with typical row given by $[0 \cdots 0 \ -1 \ 2 \ -1 \ 0 \cdots 0]$ is positive definite.

Complexity of determining the coefficients of $p_n(\lambda) = det(A - \lambda I)$ is factorial in n. So we cannot simply form the characteristic polynomial in a simple way and then find its roots.

One solution to this problem is to first reduce the matrix via algebraic operations similar to Gaussian elimination to a form where the determinant can be evaluated efficiently. Such a form is the Hessenberg form Chapter 4, Section 3.

0.1.1 Power method, Chapter 4, Section 2

Another solution to this problem is to approximate the eigenvectors by an iterative technique similar to fixed point iteration. The Rayleigh quotient can be more accurate as an estimate of the eigenvalues.

0.1.2 Homework

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(33) page 145, number 3
(34) page 158, number 2

References