Homework 11

Numerical Linear Algebra

November 27, 2017

1 Problems for everybody

1. Write a function in Matlab $H = hess(A)$ that takes in an $n \times n$ matrix and outputs a Hessenberg matrix. Your code should compute the Hessenberg matrix using Householder reflectors.

2. Write a function in Matlab $lambda = QRAlg(A)$ that take in a Hessenberg matrix and applies the QR algorithm until it converges. The output of this function will be a vector containing the eigenvalues of A. You can use Matlab's built in command qr for this algorithm.

3. Write a function in Matlab $vectors = InverseIt(A, lambda)$ that takes in a matrix A and approximations to its eigenvalues $lambda$ and applies Rayleigh quotient iteration to convergence. Your code should output a matrix $vectors$ whose columns are the approximations to the eigenvectors generated by inverse iteration.

4. Write a program $[V, lambda] = MyEig(A)$ which outputs a matrix V containing the eigenvectors of A and $lambda$ a vector containing the eigenvalues of A. Your code must use your three previous functions: $hess$, $QRAlg$, $InverseIt$.

5. #25.1, #25.3, #27.1, #32.1

2 MST Graduate student problems

1. #26.1, 26.3(a).