SF3580

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1 Task 2

1.1 (a)

Insert figure

1.2 (b)

Insert figure

1.3 (c)

Insert figure

The Rayleigh quotient only uses the symmetric part of A in

$$r(\mathbf{x}) = \mathbf{x}^H A \mathbf{x}$$

assuming $\mathbf{x}$ is normalized. The matrix A is no longer symmetric, i.e. $A \neq A^H$, but any square matrix can be decomposed into a symmetric part A_s and a nonsymmetric part A_{ns} by

$$A = \underbrace{\frac{1}{2}\left(A + A^H\right)}_{=A_s} + \underbrace{\frac{1}{2}\left(A - A^H\right)}_{=A_{ns}}.$$

Thus

$$r(\mathbf{x}) = \mathbf{x}^H A_s \mathbf{x} + \mathbf{x}^H A_{ns} \mathbf{x} = \mathbf{x}^H A_s \mathbf{x}$$

since

$$\mathbf{x}^H A_{ns} \mathbf{x} = \mathbf{x}^H A \mathbf{x} - \mathbf{x}^H A^H \mathbf{x} = 0.$$

For a nonsymmetric matrix all avaliable information is not used.

2 Task 3

test

3 Task 4

test

4 Task 6

test

5 Task 7

test $\lambda_1 = -47.016 + i0.166$ $\lambda_2 = 1.314 + i12.664$ $\lambda_3 = 0.986 - i11.898$

$$\varepsilon_i^{(m)} \leq \frac{\rho^{m-1}}{|\lambda_i - c|^{m-1}}$$