

1 Gershgorin disks

Consider the matrix

$$A = \begin{bmatrix} -6 & 2 & 0.3 & 0 & -0.7 \\ 2 & -4 & 0.1 & 0.05 & 0 \\ 0.3 & 0.1 & 2 & 0.1 & 0.1 \\ 0 & 0.05 & 0.1 & 4 & 0 \\ -0.7 & 0 & 0.1 & 0 & 6 \end{bmatrix}$$

and recall the definition of the Gershgorin disks:

$$D_i = \{z \in \mathbb{C} \mid |z - a_{ii}| \leq \sum_{j \neq i} |a_{ij}|\}.$$

(1.a) Argue that all eigenvalues of A are real.

(1.b) What are the Gershgorin disks for A ? Use them to give a set, $D \subset \mathbb{R}$, that contains all eigenvalues of A .

(1.c) Can you conclude that the eigenvalue with the largest absolute value is simple?

(1.d) Argue that A is invertible. Conclude that all diagonally dominant matrix is invertible.

2 A lecture on simultaneous iteration the reason why QG algorithm works

See Trefethen and Bau [1997](#), Lecture 28.

References

Trefethen, Lloyd N. and David III Bau (June 1997). *Numerical Linear Algebra*. SIAM. ISBN: 978-0-89871-361-9.