

Test cases for Assignment

Test cases

The following test cases assume that the codes for LU decomposition and solution of the system are written.

Case A: Solving a full-rank magic matrix

Case B: Solving a matrix from structural topology optimization

Case C: Solving a matrix from chemical kinetics

Error metrics (contd.)

Error metric 1:

Once the Matrix A is factorized into L and U using permutation P, the factors can be multiplied to recreate A.

$$Ax = b$$

$$PA' = L * U$$

$$E1 = \|PA - PA'\|_{\infty}$$

Error metric 2:

Reconstruct an RHS vector in the following way: This ensures that $x_{true} = (1, 1, \dots, 1)$.

$$A = \begin{pmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{pmatrix}$$

$$RHS = (s_1, s_2, \dots, s_n), \text{ where } s_i = \sum_{j=1}^n a_{ij}$$

$$E2 = \|x_{true} - x\|_{\infty} / \|x_{true}\|_{\infty}$$

Error metrics

Error metric 3:

Solve the matrix with the provided RHS (B1.csv). Since the true solution is now known, we compare the norm of $b - Ax$.

$$Ax = b$$

$$E3 = \|b - Ax\|_{\infty}$$