

Pseudo-code for GMRES

essentially TB alg 35.1.

1. $q_1 = b / \|b\|$, $H_0 = \text{empty matrix}$

2. for $n = 1, 2, \dots$

3. Compute $w = A q_n$

4. Orthogonalize: Compute h_1, \dots, h_n, β and y such that

$$w = h_1 q_1 + h_2 q_2 + \dots + h_n q_n + \beta y$$

and $\|y\| = 1$

5. Set $H_n = \begin{bmatrix} H_{n-1} & h \\ 0 & \beta \end{bmatrix} \in \mathbb{C}^{(n+1) \times n}$

6. Set $q_{n+1} = y$

7. Solve linear least squares problem $\min_{y \in \mathbb{C}^n} \|H_n y - \|b\| e_1\|$ where $e_1 \in \mathbb{R}^{n+1}$

8. $x = Q_n y$

9. end