ABSTRAK

Sistem persamaan linear (SPL) $A\mathbf{x} = \mathbf{b}$ dapat diselesaikan dengan menggunakan metode iterasi titik tetap. Terdapat tiga metode iterasi titik tetap yaitu metode Jacobi, Gauss-Seidel, dan Successive Over-Relaxation (SOR). Penyelesaian SPL $A\mathbf{x} = \mathbf{b}$ dengan pendekatan awal $\mathbf{x}^{(0)}$ dihitung menggunakan rumus iterasi Jacobi $x_i^{(k)} = \dfrac{\sum_{\substack{j=1\\j\neq i}}^{n}\left(-a_{ij}x_j^{(k-1)}\right)+b_i}{a_{ii}}$, atau rumus iterasi Gauss-Seidel $x_i^{(k)} = \dfrac{-\sum_{j=1}^{i-1}\left(a_{ij}x_j^{(k)}\right)-\sum_{j=i+1}^{n}\left(a_{ij}x_j^{(k-1)}\right)+b_i}{a_{ii}}$, atau rumus iterasi SOR $x_i^{(k)} = (1-\omega)x_i^{(k-1)} + \dfrac{\omega\left(-\sum_{j=1}^{i-1}(a_{ij}x_j^{(k)})-\sum_{j=i+1}^{n}(a_{ij}x_j^{(k-1)})+b_i\right)}{a_{ii}}$, di mana $x_i^{(k)}$ variabel ke-i pada iterasi ke-k, a_{ij} koefisien SPL, $x_j^{(k-1)}$ variabel ke-j pada iterasi ke-$(k$-1), b_i koefisien SPL, ω parameter.

Metode iterasi titik tetap konvergen bila dan hanya bila radius spektral dari matriks iterasi kurang dari 1 atau $(\rho(T)<1)$.

Perbedaan antara metode Jacobi, Gauss-Seidel, dan SOR terletak pada penentuan $x_i^{(k+1)}$ pada tiap-tiap iterasi. Rumus iterasi Gauss-Seidel digunakan untuk rumus iterasi SOR dengan menyertakan parameter ω yang berguna untuk kecepatan konvergensi.

Metode iterasi titik tetap dapat digunakan untuk menyelesaikan masalah akuntansi biaya di bidang ekonomi, sedangkan masalah proses kimia di bidang kimia adalah contoh metode iterasi yang divergen.

ABSTRACT

A linear equation system $A\mathbf{x} = \mathbf{b}$ can be solved with fixed-point iteration methods. There are three types of fixed-point iteration method namely Jacobi method, Gauss-Seidel method, and Successive Over-Relaxation (SOR) method. The solution of linear equation system $A\mathbf{x} = \mathbf{b}$ with an initial approximate $\mathbf{x}^{(0)}$ is calculated with Jacobi iteration formula $x_i^{(k)} = \frac{\sum_{\substack{j=1 \\ j\neq i}}^{n}\left(-a_{ij}x_j^{(k-1)}\right)+b_i}{a_{ii}}$, or Gauss-Seidel iteration formula $x_i^{(k)} = \frac{-\sum_{j=1}^{i-1}\left(a_{ij}x_j^{(k)}\right)-\sum_{j=i+1}^{n}\left(a_{ij}x_j^{(k-1)}\right)+b_i}{a_{ii}}$, or Successive Over-Relaxation iterative formula $x_i^{(k)} = (1-\omega)x_i^{(k-1)} + \frac{\omega\left(-\sum_{j=1}^{i-1}(a_{ij}x_j^{(k)})-\sum_{j=i+1}^{n}(a_{ij}x_j^{(k-1)})+b_i\right)}{a_{ii}}$ with $x_i^{(k)}$ is the i-th variable of the k-th iteration, a_{ij} coefficient of linear equation system, $x_j^{(k-1)}$ is the j-th variable of the $(k$-1)-th iteration, b_i coefficient of linear equation system, ω parameter.

Fixed-Point iteration method is convergent if and only if the spectral radius from iteration matrix is less than 1 or $(\rho(T) < 1)$.

The difference among Jacobi method, Gauss-Seidel method, and Successive Over-Relaxation method lies on the determination of $x_i^{(k+1)}$ in every iteration. Gauss-Seidel iteration formula is used for Successive Over-Relaxation (SOR) iteration formula by attaching the ω parameter which is useful for the convergence rapidity.

Fixed-Point iteration method is still can be used to solve the cost accounting problem in economic field, whereas the chemistry process problem in chemistry field is an example of divergent iteration method.