Numerical analysis

1. Error theory误差理论
   1. 结构分析的内容及目的
      1. 机构的组成、表达及分类
      2. 机构运动确定性及其分析—机构具有确定运动的条件及其自由度计算
   2. Error
      1. Absolute error
      2. Relative error
   3. Function approximation with power series
      1. The Taylor series
2. Approximate solution of non-linear equation求非线性方程的近似解
   1. Procedure
      1. Isolation of root 根的隔离
      2. 根的精确化
   2. Dichotomy二分法
   3. Simple iteration简单迭代
   4. Newton-raphson method 牛顿法
   5. Secant method 弦割法
   6. Convergence order 收敛阶
      1. Definition:
      2. Comparison
         1. Dichotomy:
         2. Simple iteration：单根 P=1；n重根 P=n
         3. Netwon-raphson method 单根 P至少为2；二重根为1
         4. Secant method:
3. Approximate solution of AX=B求方程组AX=B的近似解
   1. 直接法
      1. Cramer’s rule : impractrical to programm due to large computation amount
      2. 高斯消去法与选主元技巧
      3. 列主元消去法
   2. 迭代法
      1. Jacobi iteration
      2. Gauss-seidel iteration
   3. 迭代法的收敛条件与误差估计
4. Interpolation 插值
   1. Lagrange interpolation拉格朗日插值
      1. Linear spline interpolation
   2. Differential interpolation 牛顿插值
5. Curve fitting 拟合
6. Numerical differential 数值微分
   1. 1st order
      1. Left-sided
      2. Right-sided
      3. Central
   2. 2nd order:
7. Numerical integral 数值积分
   1. Romberg algorithm
8. Approximate solution of differential equation 求微分方程的近似解
   1. Runge-Kutta method
      1. Euler’s method
      2. Heun’s method
         1. Step1
         2. Step2