2021290010_Neloy_Mahadi_Sajjad

1) $x^* = 0,542$ proximation to
$x = 0,54225$

The relative error of x^* is $\frac{E_A}{X} = \frac{E_A}{V_A} \Rightarrow E_A \Rightarrow 0,54225 - 0,542 \Rightarrow 0,00025$

$V_A \Rightarrow 0,542$

$\Rightarrow \frac{0,00025}{0,542} \Rightarrow 0,00046125$

The Relative error of $x^* \Rightarrow 0,00046125$

The absolute error of x^* is $0,00025$

2) $\|x\|_1 \Rightarrow \begin{bmatrix} |0| + & +2| \\ |3| + & |1| \end{bmatrix} \Rightarrow \begin{bmatrix} 2 \\ 4 \end{bmatrix}$

$\|x\|_\infty \Rightarrow \begin{bmatrix} |0| & |-2| \\ |3| & |1| \end{bmatrix} = \begin{bmatrix} 1 \\ 5 \end{bmatrix}$

$\|A\|_\infty \Rightarrow \begin{bmatrix} 1+4+0+2 \\ 3+6+3+1 \end{bmatrix} = \begin{bmatrix} 7 \\ 13 \end{bmatrix}$

$\|x\|_2 \Rightarrow \begin{bmatrix} |0| & |-2| \\ + & + \\ |3| & |1| \end{bmatrix} = \begin{bmatrix} 3 & 3 \end{bmatrix}$

3) 3 significant figures:

(1) 0,7285 ⇒ ~~7,28~~ 0,729 ⇒ 7,28 $\times 10^{-1}$

(2) 2,23712 ⇒ 2,24

(3) 0,4155 ⇒ 4,16 $\times 10^{-1}$

(4) 0,5342 ⇒ ~~0,533~~ 5,34 $\times 10^{-1}$

II (1) Reasons for using simple partial pivoting

→ It is used to avoid roundoff errors that could be caused when dividing every entry of a row by a pivot value that is relatively small in comparison to its remaining row entry.

→ So that its easy to do row interchange if necessary.

(2) Method for getting dominant eigenvalue of a matrix

→ The power method was introduced

→ To apply power method, one needs to begin with an initial guess for the eigenvector of the dominant eigenvalue

→ Power method is very useful but not applicable when a matrix is nondiagonalizable.

→ The Inverse Power Method calculates the eigenvalue with smallest absolute value.

III PROVE THE THEOREM

→ Maximum absolute error is an estimation given when the actual absolute error is unknown.

→ The absolute error is the difference between the actual and measured value.

→ If the actual value is known and the measured value is known then to calculate absolute error is simple we just substract.

⇒ Proof

Absolute error (E_A) = measure value (V_m) − Actual value $(V_A$

$$E_A = V_m - V_A$$

when V_m is known fore example ⇒ 5 ~~0~~

$$V_A = 3$$

$$E_A = 5 - 3 \Rightarrow 2$$

Using Maximum absolute error :-

For example measuring the distance of the ~~buildig~~ building propotional to the foot.

The length = 30 feet.

we measure = 1 foot

Since a person has 2 foot and the measuring unit is 1 foot ∴ the maximum possible error is $\frac{1}{2}$

→ It might be $-\frac{1}{2}$ or $+\frac{1}{2}$ so denoted by $\pm\frac{1}{2}$ ft.

The final answer will be $30 \pm .5$ ft that will be the measurement

IV. JACOBI iterative

$x_1 - 8x_2 + x_3 = 1$

$7x_1 + 2x_2 + 3x_3 = 3$

$x_1 + 2x_2 + 5x_3 = 2$

$x_1 = 1 + 8x_2 - x_3$

$x_2 = 3/2 - 7/2\, x_1 - 3/2\, x_3$

$x_3 = 2/5 - \cancel{x_1}/5 + 2/5\, x_2$

initial values

$x_1 = 0$, $x_2 = 0$, $x_3 = 0$

$x_1 = 1 + 0 - 0 = 1$

$x_2 = 3/2 - 0 - 0 = 3/2$

$x_3 = 2/5 - 0 + 0 = 2/5$

Second values

$x_1 = 1$, $x_2 = 1$, $x_3\ 1$

$x_1 = 8$

$x_2 = -7/2$

$x_3 = 1/5$

Third values

$x_1 = 2$, $x_2 = 2$, $x_3 = 2$

$x_1 = 15$

$x_2 = -8\tfrac{1}{2}$

$x_3 = 4/5$

forth values

$x_1 = 3$, $x_2 = 3$, $x_4 = 3$

$x_1 \Rightarrow 22$

$x_2 \Rightarrow 13\tfrac{1}{2}$

$x_3 \Rightarrow 1$

firth values

$x_1 = 4$, $x_2 = 4$, $x_5 = 4$

$x_1 = 29$

$x_2 = -18\tfrac{1}{2}$

$x_3 = 1\tfrac{1}{5}$

n	0	1	2	3	4	5
x_1	0,000	1	8	15	22	29
x_2	0,000	3/2	$-7/2$	$-8\tfrac{1}{2}$	$-13\tfrac{1}{2}$	$-18\tfrac{1}{2}$
x_3	0,000	2/5	1/5	4/5	1	$1\tfrac{1}{5}$

$x_1 = 29$

$x_2 = -18\tfrac{1}{2}$

$x_3 = 1\tfrac{1}{5}$

2. The missing term

x	2	3	4
$F(x)$	0,135	0,1175	0,100

→ Here we are given 2 value of $F(x)$. We assume that $F(x)$ is polynomial of degree 1

Hence $\Delta^2 y_0 = 0$

$(E-1)^2 y_0 = 0$

$(E^2 - 2E + 1) y_0 = 0$

$y_2 - 2y_1 + y_0 = 0$

$\therefore\ 0{,}100 - 2(a) + 0.135 = 0$

$-2a + 0{,}235 = 0$

$a = \frac{-0{,}235}{-2}$

$a = 0{,}1175$

(V) The linear Lagrange interpolating polynomial.

$P(0) = ?\ ,\ P(1) = 4\ ,\ P(2) = 1$

$L(x) = [(x-4)(x-1)] / [(2-1)(4-1)]$

$L(1) = \frac{(x-4)(x-1)}{3}$

$L(1) = -1$

$P = 1$

VI $\sqrt[3]{115}$

let $f(x) = \sqrt[3]{115}$

$$\frac{d}{dx}\left(\sqrt[3]{115}\right) = 0$$

$\therefore f(x) = 0$

Since we ~~dont~~ get find derivative $= 0$ that means our third value is $\sqrt[3]{115}$ it ~~does~~ does not change

VII The relationship of computer science and numerical analysis

→ Numerical analysis is an area of mathematics and in computer science it creates, analyzes and implements algorithms for obtaining numerical solution to problems involving continuous variables.

→ It works well on system that predicts things

→ Also works on simulations

→ The back borne of software algorithms.