CE 506 '02 Homework #3 Solution, Obs. Only – using matrix method

Problem 3-9

#	obs
1	30-00-20
2	50-00-00
3	20-00-00
4	40-00-20

n=4, n_0=3, r=1

1 cond. eqn.

Av = f

$$\hat{l}_1 + \hat{l}_4 = \hat{l}_2 + \hat{l}_3$$

or,

$$\hat{l}_1 - \hat{l}_2 - \hat{l}_3 + \hat{l}_4 = 0$$

$$\mathbf{A} = \begin{bmatrix} 1 & -1 & -1 & 1 \end{bmatrix}$$

$$\mathbf{W} = \mathbf{I_4}$$

$$\mathbf{f} = -\mathbf{A} * \mathbf{l}$$

$$\begin{bmatrix} -\mathbf{W} & \mathbf{A}^T \\ \mathbf{A} & \mathbf{0} \end{bmatrix} \begin{bmatrix} \mathbf{v} \\ \mathbf{k} \end{bmatrix} = \begin{bmatrix} \mathbf{0} \\ \mathbf{f} \end{bmatrix}$$

$$\mathbf{v} = \begin{bmatrix} -10 \\ 10 \\ 10 \\ -10 \end{bmatrix} \text{sec}$$

$$\hat{\mathbf{l}} = \begin{bmatrix} 30\text{-}00\text{-}10 \\ 50\text{-}00\text{-}10 \\ 20\text{-}00\text{-}10 \\ 40\text{-}00\text{-}10 \end{bmatrix}$$

Problem 3-10

#	x	y
1	1	9.60
2	2	8.85
3	3	8.05
4	4	7.50
5	5	7.15

n=5, n_0=2, r=3

3 condition equations

Av = f

$$\frac{\hat{y}_3 - \hat{y}_1}{x_3 - x_1} = \frac{\hat{y}_2 - \hat{y}_1}{x_2 - x_1}$$

$$\frac{\hat{y}_4 - \hat{y}_1}{x_4 - x_1} = \frac{\hat{y}_2 - \hat{y}_1}{x_2 - x_1}$$

$$\frac{\hat{y}_5 - \hat{y}_1}{x_5 - x_1} = \frac{\hat{y}_2 - \hat{y}_1}{x_2 - x_1}$$

$$\hat{y}_1 - 2\hat{y}_2 + \hat{y}_3 = 0$$

$$2\hat{y}_1 - 3\hat{y}_2 + \hat{y}_4 = 0$$

$$3\hat{y}_1 - 4\hat{y}_2 + \hat{y}_5 = 0$$

$$\mathbf{A} = \begin{bmatrix} 1 & -2 & 1 & 0 & 0 \\ 2 & -3 & 0 & 1 & 0 \\ 3 & -4 & 0 & 0 & 1 \end{bmatrix}$$

$$\mathbf{W} = \mathbf{I_5}, \ \mathbf{f} = -\mathbf{Al}$$

$$\begin{bmatrix} -\mathbf{W} & \mathbf{A}^T \\ \mathbf{A} & \mathbf{0} \end{bmatrix} \begin{bmatrix} \mathbf{v} \\ \mathbf{k} \end{bmatrix} = \begin{bmatrix} \mathbf{0} \\ \mathbf{f} \end{bmatrix}$$

v	**l-hat**
-.120	9.480
.005	8.855
.180	8.230
.105	7.605
-.170	6.980