Photogrammetry II

3rd Stage

The Geometry of Aerial Stereo-Pair (Space Intersection)

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Space Intersection Spatial Case

- $x = -f\left[\frac{m_{11}(X-X_L)+m_{12}(Y-Y_L)+m_{13}(Z-Z_L)}{m_{31}(X-X_L)+m_{32}(Y-Y_L)+m_{33}(Z-Z_L)}\right]$

- $y= -f\left[\frac{m_{21}(X-X_L)+m_{22}(Y-Y_L)+m_{23}(Z-Z_L)}{m_{31}(X-X_L)+m_{32}(Y-Y_L)+m_{33}(Z-Z_L)}\right]$

Space Intersection Spatial Case

- qx_a + rf =0
- qy_a + sf=0
- q = $m_{31}(X_A - X_L) + m_{32}(Y_A - Y_L) + m_{33}(Z_A - Z_L)$
- r = $m_{11}(X_A - X_L) + m_{12}(Y_A - Y_L) + m_{13}(Z_A - Z_L)$
- s = $m_{21}(X_A - X_L) + m_{22}(Y_A - Y_L) + m_{23}(Z_A - Z_L)$

Space Intersection Spatial Case

- $v_1 + B^s{}_1\Delta + F_1 = 0$

  $v_2 + B^s{}_2\Delta + F_2 = 0$

  $V + B^s\Delta^s + F = 0$

$$B^s{}_i = \begin{bmatrix} \frac{\partial F_{(x_i)}}{\partial(X,Y,Z)} \\ \frac{\partial F_{(y_i)}}{\partial(X,Y,Z)} \end{bmatrix} = \begin{bmatrix} B^s{}_1 \\ B^s{}_2 \end{bmatrix}, \quad vi = \begin{bmatrix} v_{xi} \\ v_{yi} \end{bmatrix}, \Delta^s = \begin{bmatrix} dX \\ dY \\ dZ \end{bmatrix} \quad Fi = \begin{bmatrix} F_{(xi)} \\ F_{(yi)} \end{bmatrix}$$

Space Intersection General Case

- $V_{1j} + B^{e}{}_{1j}\ \Delta^{e}{}_{1} + B^{s}{}_{1j}\ \Delta^{s}{}_{j} + F_{1j} = 0$ Photo #1

  $V_{2j} + B^{e}{}_{2j}\ \Delta^{e}{}_{2} + B^{s}{}_{2j}\ \Delta^{s}{}_{j} + F_{2j} = 0$ Photo #2

  $V_{ij} + B^{e}{}_{ij}\Delta^{e}{}_{i} + B^{s}{}_{ij}\Delta^{e}{}_{j} + F_{ij} = 0$ for photo coordinate

- $V^{e}{}_{1} - \Delta^{e}{}_{1} + F^{e}{}_{1} = 0$ Photo #1

  $V^{e}{}_{2} - \Delta^{e}{}_{2} + F^{e}{}_{2} = 0$ Photo #2

  $V^{e}{}_{i} - \Delta^{e}{}_{i} + F^{e}{}_{i} = 0$ for Exterior Orientation elements

  $V^{s}{}_{j} - \Delta^{s}{}_{j} + F^{s}{}_{j} = 0$ for surveying coordinates

Space Intersection General Case

- $\bar{V} - \bar{B}\bar{\Delta} + \bar{F} = 0$

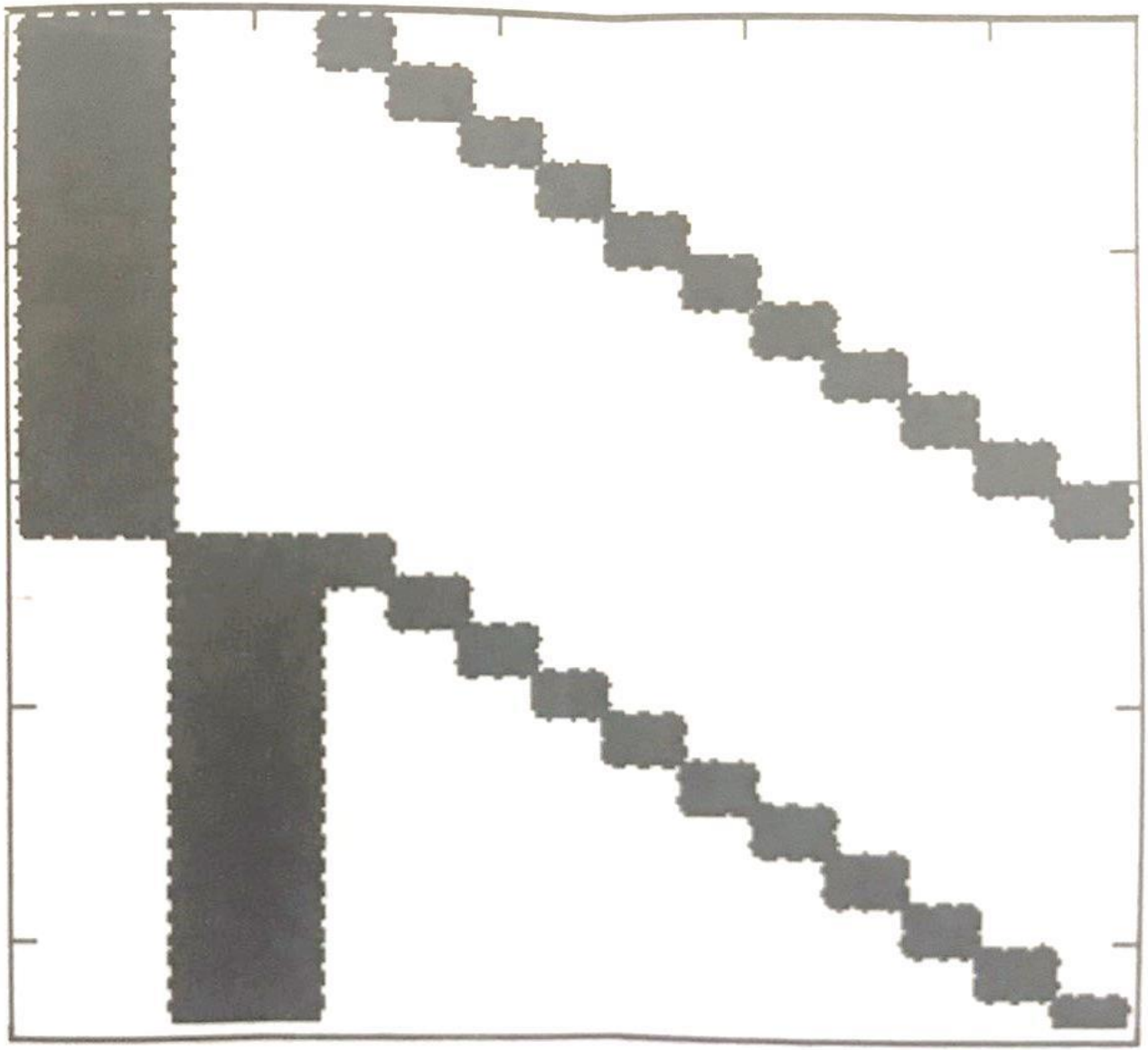
- $$\begin{bmatrix} V_{(4n*1)} \\ V^{e}{}_{(6m*1)} \\ V^{s}{}_{(3n*1)} \end{bmatrix} + \begin{bmatrix} B^{e}{}_{(4n*6m)} & B^{s}{}_{(4n*3n)} \\ -I_{(12*12)} & 0 \\ 0 & -I_{(3n*3n)} \end{bmatrix} * \begin{bmatrix} \Delta_{e}{}_{(12*1)} \\ \Delta_{s}{}_{(3n*1)} \end{bmatrix} + \begin{bmatrix} F_{(4n*1)} \\ F_{e}{}_{(12*1)} \\ F_{s}{}_{(3n*1)} \end{bmatrix} = 0$$

- $\bar{N}\bar{\Delta} = \bar{U}$

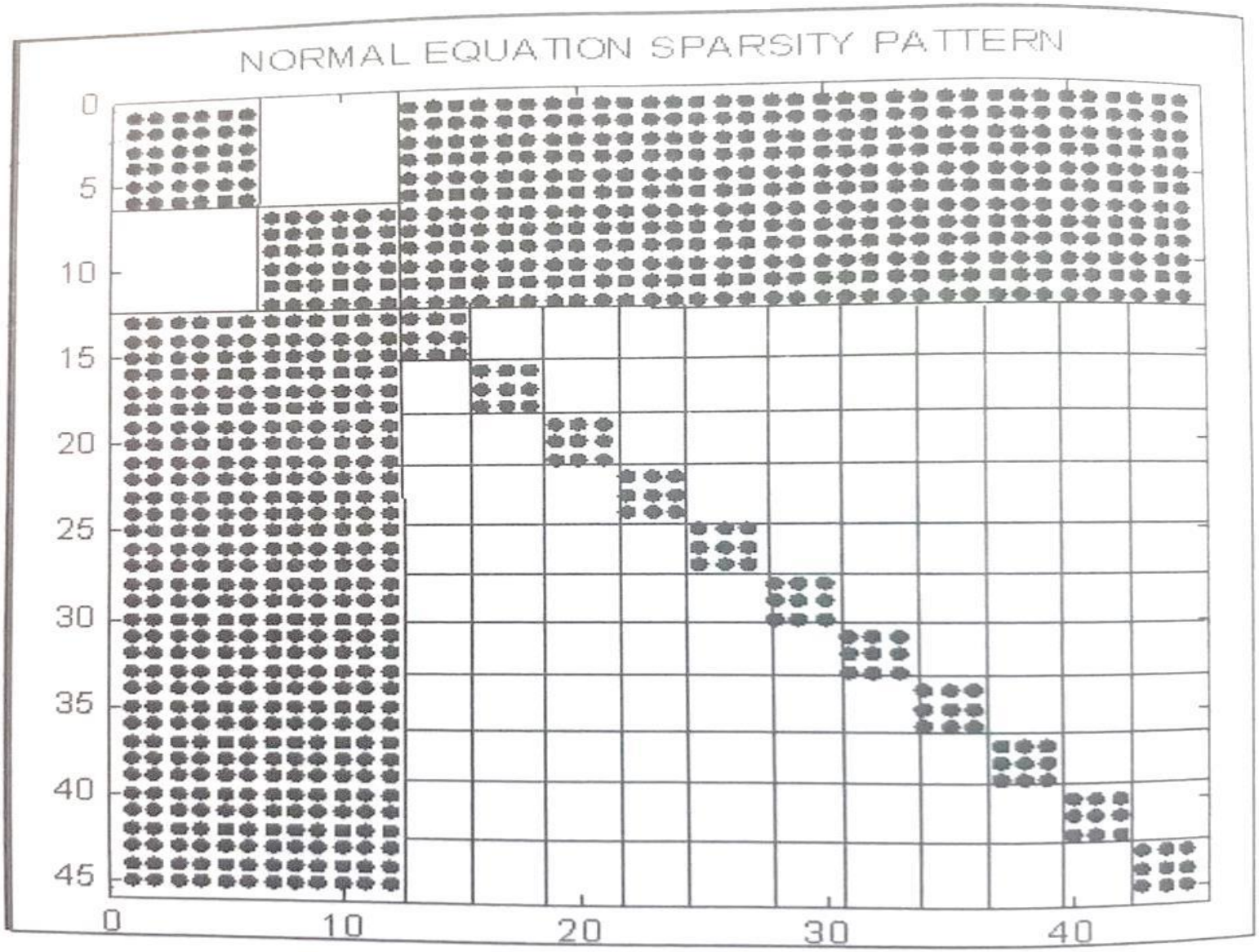
Space Intersection General Case

- $$\begin{bmatrix} N^e + w^e & N^{es} \\ symmetric & N^s + W^s \end{bmatrix} \begin{bmatrix} \Delta^e \\ \Delta^s \end{bmatrix} = \begin{bmatrix} \cup^e \\ \cup^s \end{bmatrix}$$
- $$\begin{bmatrix} \left[B^{e^T} W\, B^e + W^e\right]_{12*12} & \left[B^{e^T} W B^s\right]_{12*3n} \\ symmetic & \left[B^{s^T} W B^s + W^s\right]_{3n*3n} \end{bmatrix} * \begin{bmatrix} \Delta^e{}_{12*1} \\ \Delta^s{}_{3n*1} \end{bmatrix} + \begin{bmatrix} \left[B^{e^T} W\, F + W^e F^e\right]_{12*1} \\ \left[B^{s^T} W\, F + W^s F^s\right]_{3n*1} \end{bmatrix} = 0$$

$$B^e B^s$$



$\bar{N}$


NORMAL EQUATION SPARSITY PATTERN
0
5
10
15
20
25
30
35
40
45
0
10
20
30
40

References

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