

# Ressecção – Método paramétrico

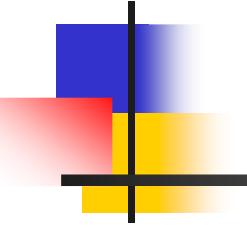
Uma imagem com POE aproximado

$$(X_0, Y_0, Z_0, \omega, \varphi, \kappa) = (2400\text{m}, 4200\text{m}, 2800\text{m}, 0^\circ, 0^\circ, 30^\circ)$$

foi tomada com uma câmara calibrada com POI  $(x_0; y_0; f) = (0\text{mm}; 0\text{mm}; 153,010\text{mm})$   
A partir da observação de fotocoordenadas  $(x, y)$ , e de coordenadas geodésicas locais  $(X, Y, Z)$  de sete pontos, conforme tabela abaixo, calcule os parâmetros de orientação exterior ajustados. Considere  $(x, y)$  como observações e  $(X, Y, Z)$  como valores fixos isentos de erros.

$$\sigma_x = \sigma_y = 0,40\text{mm}$$

Ponto	Fotocoordenadas (em mm)		Coordenadas Geodésicas Locais (em m)		
	x	y	X	Y	Z
1	57,880	3,726	3027,941	4629,186	920,184
2	76,097	48,110	2953,797	5222,251	903,042
3	-15,803	58,601	1903,811	4765,178	905,396
4	-14,876	86,594	1730,967	5061,563	911,622
5	-53,442	-28,298	2039,821	3603,992	918,265
6	-104,090	6,251	1298,400	3665,744	935,397
7	17,817	-77,461	3102,065	3517,488	915,447



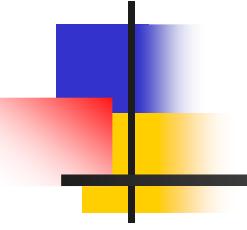
## Ressecção – Método paramétrico

1) Modelo funcional:

$$L_a = F(X_a) \quad \rightarrow \text{Paramétrico}$$

$$\begin{cases} x = -f \frac{m_{11}(X - X_0) + m_{12}(Y - Y_0) + m_{13}(Z - Z_0)}{m_{31}(X - X_0) + m_{32}(Y - Y_0) + m_{33}(Z - Z_0)} = -f \frac{Q_x}{Q_z} \\ y = -f \frac{m_{21}(X - X_0) + m_{22}(Y - Y_0) + m_{23}(Z - Z_0)}{m_{31}(X - X_0) + m_{32}(Y - Y_0) + m_{33}(Z - Z_0)} = -f \frac{Q_y}{Q_z} \end{cases}$$

$$M_{\kappa\varphi\omega} = \begin{bmatrix} \cos \varphi \cos \kappa & \cos \omega \sin \kappa + \sin \omega \sin \varphi \cos \kappa & \sin \omega \sin \kappa - \cos \omega \sin \varphi \cos \kappa \\ -\cos \varphi \sin \kappa & \cos \omega \cos \kappa - \sin \omega \sin \varphi \sin \kappa & \sin \omega \cos \kappa + \cos \omega \sin \varphi \sin \kappa \\ \sin \varphi & -\sin \omega \cos \varphi & \cos \omega \cos \varphi \end{bmatrix}$$



## Ressecção – Método paramétrico

Derivadas para matriz Jacobiana

$$\frac{\partial F_x}{\partial X_0} = -f \frac{(Q_z)(-m_{11}) - (Q_x)(-m_{31})}{(Q_z)^2}$$

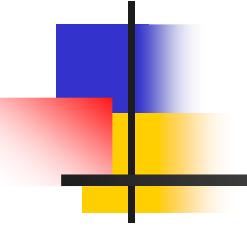
$$\frac{\partial F_x}{\partial Y_0} = -f \frac{(Q_z)(-m_{12}) - (Q_x)(-m_{32})}{(Q_z)^2}$$

$$\frac{\partial F_x}{\partial Z_0} = -f \frac{(Q_z)(-m_{13}) - (Q_x)(-m_{33})}{(Q_z)^2}$$

$$\frac{\partial F_x}{\partial \omega} = -f \frac{(Q_z)((Y - Y_0)(-m_{13}) + (Z - Z_0)(m_{12})) - (Q_x)((Y - Y_0)(-m_{33}) + (Z - Z_0)(m_{32}))}{(Q_z)^2}$$

$$\begin{aligned} \frac{\partial F_x}{\partial \varphi} = & -f \frac{Q_z((X - X_0)(-\sin \varphi \cos \kappa) + (Y - Y_0)(\sin \omega \cos \varphi \cos \kappa) + (Z - Z_0)(-\cos \omega \cos \varphi \cos \kappa))}{(Q_z)^2} \\ & + f \frac{Q_x((X - X_0)(\cos \varphi) + (Y - Y_0)(\sin \omega \sin \varphi) + (Z - Z_0)(-\cos \omega \sin \varphi))}{(Q_z)^2} \end{aligned}$$

$$\frac{\partial F_x}{\partial \kappa} = -f \frac{(Q_z)((X - X_0)(-\cos \varphi \sin \kappa) + (Y - Y_0)(m_{22}) + (Z - Z_0)(m_{23}))}{(Q_z)^2}$$



## Ressecção – Método paramétrico

Derivadas para matriz Jacobiana

$$\frac{\partial F_y}{\partial X_0} = -f \frac{(Q_z)(-m_{21}) - (Q_y)(-m_{31})}{(Q_z)^2}$$

$$\frac{\partial F_y}{\partial Y_0} = -f \frac{(Q_z)(-m_{22}) - (Q_y)(-m_{32})}{(Q_z)^2}$$

$$\frac{\partial F_y}{\partial Z_0} = -f \frac{(Q_z)(-m_{23}) - (Q_y)(-m_{33})}{(Q_z)^2}$$

$$\frac{\partial F_y}{\partial \omega} = -f \frac{(Q_z)((Y - Y_0)(-m_{23}) + (Z - Z_0)(m_{22})) - (Q_y)((Y - Y_0)(-m_{33}) + (Z - Z_0)(m_{32}))}{(Q_z)^2}$$

$$\frac{\partial F_y}{\partial \varphi} = -f \frac{Q_z((X - X_0)(\sin \varphi \sin \kappa) + (Y - Y_0)(-\sin \omega \cos \varphi \sin \kappa) + (Z - Z_0)(\cos \omega \cos \varphi \sin \kappa))}{(Q_z)^2}$$

$$+ f \frac{Q_y((X - X_0)(\cos \varphi) + (Y - Y_0)(\sin \omega \sin \varphi) + (Z - Z_0)(-\cos \omega \sin \varphi))}{(Q_z)^2}$$

$$\frac{\partial F_y}{\partial \kappa} = -f \frac{(Q_z)((X - X_0)(-\cos \varphi \cos \kappa) + (Y - Y_0)(-m_{12}) + (Z - Z_0)(-m_{13}))}{(Q_z)^2}$$