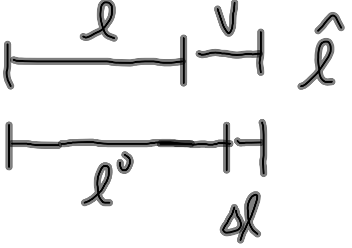
NonLinear LS : Ind. Obs. model 14-1

$\hat{\ell} = G(x)$

$F(\hat{\ell}, x) = \hat{\ell} - G(x) = 0$ ✓

Taylor Series $F(\hat{\ell}, x) \approx F(\ell^0, x^0) + \frac{\partial F}{\partial \ell}\delta\ell + \frac{\partial F}{\partial x}\delta x = 0$



v is added to original obs.

$\delta\ell$ is added to current approx.

$\ell + v = \ell^0 + \delta\ell$, $\delta\ell = \underline{(\ell - \ell^0) + v}$

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$$F(\hat{\ell}, x) \approx \underbrace{F(\ell^0, x^0)}_{\ell^0 - G(x^0)} + \underbrace{\frac{\partial F}{\partial \ell}}_{I_n}\delta\ell + \underbrace{\frac{\partial F}{\partial x}}_{B}\delta x = 0 \qquad 14\text{-}2$$

$\delta\ell \rightarrow (\ell - \ell^0 + v)$

$$= \boxed{\ell^0 - \ell^0} + \underbrace{\ell - G(x^0)}_{F(\ell, x^0)} + v + B\delta = 0$$

$\boxed{\ell^0 - \ell^0} \equiv$

original obs

refined params

$$v + B\delta = \underbrace{-F(\ell, x^0)}_{f}$$

$$\boxed{v + B\delta = f}$$

B : eval @ x^0

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$$v + B\,\delta = f \qquad u = n_0 \qquad \text{14-3}$$

$$(n,1) \quad (n,n_0)\,(n_0,1) \quad (n,1) \qquad W$$

$$\underbrace{B, f}_{\text{eval } @\ x^0}, W \Rightarrow \qquad \delta = (B^T W B)^{-1} B^T W f$$

$$X' = x^0 + \delta$$

examine magn. of δ

after convergence

$$v = f - B\delta$$

$$\hat{\ell} = \ell + v$$

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14-4

Observations only $F(\hat{\ell}) = 0$

Taylor Series $F(\hat{\ell}) \approx F(\ell^0) + \underbrace{\frac{\partial F}{\partial \ell}}_{A}\,\delta\ell = 0$

$$\delta\ell = \ell - \ell^0 + v$$

$$0 = F(\ell^0) + A(\ell - \ell^0) + Av$$

$$Av = \underbrace{-F(\ell^0) - A(\ell - \ell^0)}_{f}$$

$$Av = f$$
$$k = W_e f$$
$$v = QA^T k$$

$$\ell' = \ell + v$$

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$\underline{A}$, $\underline{F(l^0)}$, l, W

$Av = f$

$k = (AQA^T)^{-1} f$

$v = QA^T k$

14-5

$\Delta l = l^0_{current} - l^0_{previous}$

evaluate magn. for convergence

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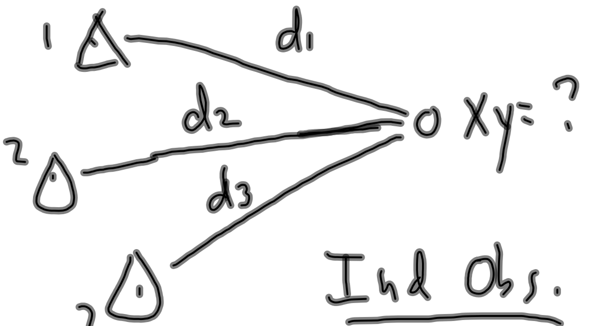

$n = 3$

$n_0 = 2$

$r = 1$

14-6

Ind Obs.

Δ perfect

$d_1 = \left[(x - x_1)^2 + (y - y_1)^2\right]^{1/2}$

$F_1 = \hat{d}_1 - \left[(x - x_1)^2 + (y - y_1)^2\right]^{1/2} = 0$

$F_2 = \hat{d}_2 - \left[(x - x_2)^2 + (y - y_2)^2\right]^{1/2} = 0$

$F_3 = \hat{d}_3 - \left[(x - x_3)^2 + (y - y_3)^2\right]^{1/2} = 0$

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$$F_i = \hat{d}_i - \left[(x-x_i)^2 + (y-y_i)^2\right]^{1/2} = 0 \qquad 14\text{-}7$$

$$\frac{\partial F_i}{\partial x} = -\frac{1}{2}\underbrace{\left[(x-x_i)^2 + (y-y_i)^2\right]}^{-1/2} 2(x-x_i)$$

$$= \frac{-(x^0 - x_i)}{D_i^0}$$

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