35-1

Unified LS first deriv. Δ: $\hat{X} = x + \delta$

this deriv. Δ: total parameter value

$$x + V_x = \Delta \qquad A(\ell + v) + B\Delta = d$$

$$V_x - \Delta = -x \qquad Av + B\Delta = \underbrace{d - A\ell}_{f}$$

f (not $\bar{f}$)

$$\left.\begin{array}{l} Av + B\Delta = f \\ v_x - \Delta = -x \end{array}\right\} \quad \underbrace{\begin{bmatrix} A & 0 \\ 0 & I \end{bmatrix}}_{\dot{A}} \underbrace{\begin{bmatrix} v \\ v_x \end{bmatrix}}_{\dot{v}} + \underbrace{\begin{bmatrix} B \\ -I \end{bmatrix}}_{\dot{B}} \Delta = \underbrace{\begin{bmatrix} f \\ -x \end{bmatrix}}_{\dot{f}}$$

$$\dot{A}\,\dot{v} + \dot{B}\Delta = \dot{f}$$

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$\dot{N}$ same as before $[N + W_{xx}]$ ✓

$$\dot{t} = \dot{B}^T \dot{W}_e \dot{f} = \begin{bmatrix} B^T & -I \end{bmatrix} \begin{bmatrix} W_e & 0 \\ 0 & W_{xx} \end{bmatrix} \begin{pmatrix} f \\ -x \end{pmatrix}$$

$$= \begin{bmatrix} B^T W_e & -W_{xx} \end{bmatrix} \begin{pmatrix} f \\ -x \end{pmatrix}$$

$$= \underbrace{B^T W_e f}_{t} + W_{xx} \cdot x$$

$$t + W_{xx} \cdot x$$

$$\left.\begin{array}{l} [N + W_{xx}]\,\Delta = (t + W_{xx} \cdot x) \\ \dot{N}\,\Delta = \dot{t} \end{array}\right\} \quad \Delta = [N + W_{xx}]^{-1}(t + W_{xx} \cdot x)$$

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if <u>nonlinear</u> : $F(l, x) = 0$ $\left(\begin{matrix}\text{if cnd, obs, then} \\ A = I\end{matrix}\right)$ 35-3

linearize $Av + B\delta = f$

$$= -F(l^0, x^0) - A\underline{\underline{(l - l^0)}}$$

- $\hat{X} = X^0 + \Delta = X + V_X$

$\uparrow$ current estimate $\qquad \uparrow$ original estimate

$\left(\hat{l} = l^0 + \delta l = l + v\right)$

$\nwarrow$ rearrange

- $V_X - \delta = \underline{\underline{x^0 - x}} = f_x$

$$Av + B\delta = f$$

$$v_X - \delta = f_x \;(x^0 - x)$$

from linear derivation

$(N + W_{XX}) \quad = \quad N' =$ same expressions

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