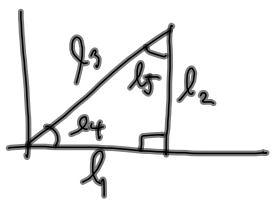
Lecture 15

example for NL obs only



$$l = \begin{bmatrix} 10.1 \\ 7.4 \\ 12.5 \\ 36.22^\circ \\ 53.78^\circ \end{bmatrix} \begin{matrix} \\ \\ \\ * \\ * \end{matrix}$$

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$n = 5$

$n_0 = 2$

$r = 3$

$c = r = 3$

* must carry angle with as redundancy in NL problems

$l_1^2 + l_2^2 = l_3^2$, $l_4 + l_f = \pi/2$ (Rad), $l_4 = \text{atan}(l_3/l_1)$

$F_1 = l_1^2 + l_2^2 - l_3^2 = 0$

$F_2 = l_4 + l_f - \pi/2 = 0$

$F_3 = l_4 - \text{atan}(l_2/l_1) = 0$

l, l^0

Avg of A: $A = \frac{\partial F}{\partial l}$

$f = -F - A(l - l^0)$

$l^0 = l + v$

$\frac{d}{dx}\text{atan}(u) = \frac{1}{1+u^2} \cdot \frac{du}{dx}$

$\frac{\partial F_1}{\partial l_1} = 2l_1$, $\frac{\partial F_1}{\partial l_2} = 2l_2$, $\frac{\partial F_1}{\partial l_3} = -2l_3$, $\frac{\partial F_1}{\partial l_4} = 0$, $\frac{\partial F_1}{\partial l_5} = 0$

evaluate w/ l^0

$\frac{\partial F_2}{\partial l_1} = 0$, $\frac{\partial F_2}{\partial l_2} = 0$, $\frac{\partial F_2}{\partial l_3} = 0$, $\frac{\partial F_2}{\partial l_4} = 1$, $\frac{\partial F_2}{\partial l_5} = 1$

$\frac{\partial F_3}{\partial l_3} = 0$, $\frac{\partial F_3}{\partial l_5} = 0$, $\frac{\partial F_3}{\partial l_4} = 1$, $\frac{\partial F_3}{\partial l_2} = -\frac{1}{1 + l_2^2/l_1^2} \cdot \frac{1}{l_1}\left(\frac{l_1}{l_1}\right) = -\frac{l_1}{l_1^2 + l_2^2}$

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$F_3 = l_4 - \text{atan}(l_2/l_1) = 0$

$\frac{\partial F_3}{\partial l_1} = -\frac{1}{1 + \frac{l_2^2}{l_1^2}} \cdot \frac{-l_2}{l_1^2} = \frac{+l_2}{l_1^2 + l_2^2}$ eval @ l^0

$$A = \begin{bmatrix} 2l_1^0 & 2l_2^0 & -2l_3^0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ \frac{l_2^0}{l_1^{0\,2} + l_2^{0\,2}} & \frac{-l_1^0}{l_1^{0\,2} + l_2^{0\,2}} & 0 & 1 & 0 \end{bmatrix}$$

$$f = \begin{bmatrix} -F_1(l^0) \\ -F_2(l^0) \\ -F_3(l^0) \end{bmatrix} - A(l - l^0)$$

$\sigma_0 = 0.1$, $\sigma_0^2 = .01$

$\sigma_d = 0.1$ $\quad w_d = \frac{.01}{.01} = 1$

$\sigma_\alpha = .005\,R$ $\quad w_\alpha = \frac{.01}{(.005)^2} = 400$

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15-3

$$W = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 400 & 0 \\ 0 & 0 & 0 & 0 & 400 \end{bmatrix}$$

$K = W_e f$

$v = QA^T k$ ← $l^0_{old} = l^0$

$l^0 = l + v$

$A, w, f, w^{-1} \to Q$

$Q_e = AQA^T$, $W_e = Q_e^{-1}$

$\delta l = l^0 - l^0_{old}$

└ should go to ZERO

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