Organizing Data for HW7

dt_s : μsec

123.456

123.456×10^{-6} sec

$c \cdot dt$

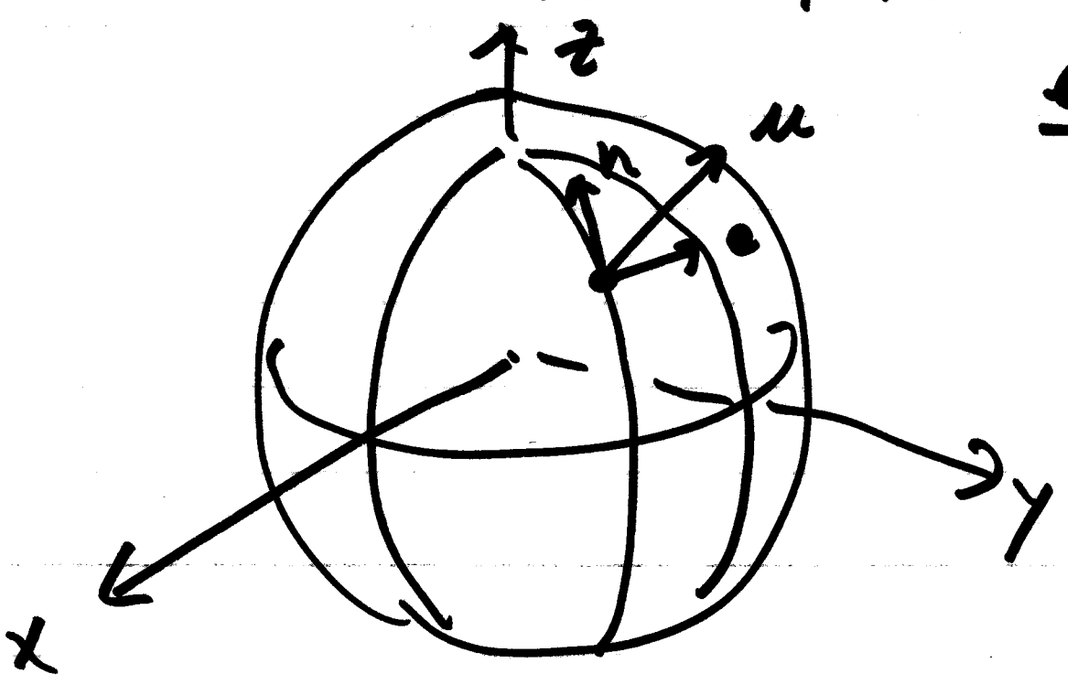
PR (c1)	X_s	Y_s	Z_s	dt_s	epoch 1
PR	X_s	Y_s	Z_s	dt_s	
⋮					
PR	X_s	Y_s	Z_s	dt_s	
PR	X_s	Y_s	Z_s	dt_s	epoch 2
⋮					
PR	X_s	Y_s	Z_s	dt_s	
PR					3
⋮					
PR					

elevation angle (lect 32)

sat. coords. ↓ ref. pt. = receiver location

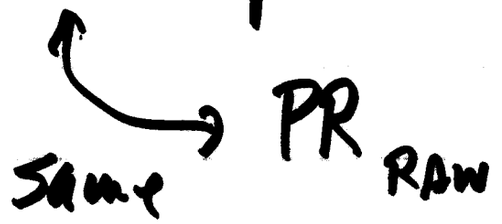
$$\begin{bmatrix} e \\ n \\ u \end{bmatrix} = M_1(90^\circ - \underset{\text{lat.}}{\downarrow}\phi)\, M_3(\underset{\text{long.}}{\downarrow}\lambda + 90^\circ) \left[\begin{pmatrix} x \\ y \\ z \end{pmatrix} - \begin{pmatrix} x_0 \\ y_0 \\ z_0 \end{pmatrix} \right]$$

$XYZ \rightarrow \phi\lambda h$



$$\text{elev. angle} = \tan^{-1}\left(\frac{u}{\sqrt{e^2+n^2}}\right)$$

obs. file C1 pseudorange on C/A L1



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finish derivation of unified LS, nonlinear case

$$A v + B \Delta = f \qquad = -F(\ell^0, x^0) - A(\ell - \ell^0)$$

Δ: "total parameter" linear
"total correction" nonlinear

$$\hat{x} = x^0 + \Delta = x + v_x$$

$$=$$

$$v_x - \Delta = x^0 - x = f_x$$

$$A v + B \omega = f$$

$$v_x - \omega = f_x \qquad (x^0 - x)$$

$$\dot{A}\dot{v} + \dot{B}\omega = \dot{f}$$

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

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

$$\dot{t} = (t - W_{xx} \cdot f_x)$$

$$(B^T W_e f)$$

NE unified LS (nonlinear)

$$\Delta = [N + W_{xx}]^{-1} (t - W_{xx} \cdot f_x)$$

$$\omega = \bar{N}^{-1} t$$

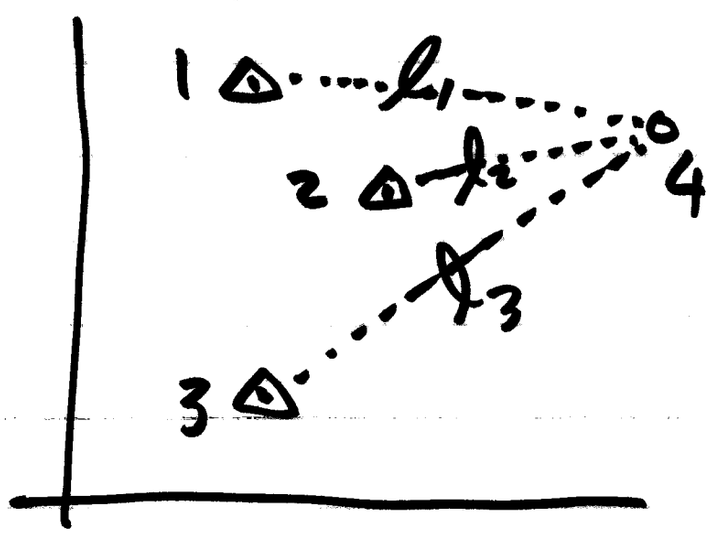
$$\dot{V} = \dot{Q}\dot{A}^T\dot{k}$$

$$\dot{k} = \dot{W}_e(\dot{f} - \dot{B}\Delta)$$

$$\dot{v} = \begin{pmatrix} V \\ V_x \end{pmatrix}$$

$$V = QA^T W_e(f - B\Delta)$$

Examples 2D dist obs.



X	Y
200	1100
400	890
200	330
802	1000

$$l = \begin{bmatrix} 610.1 \\ 417.0 \\ 900.5 \end{bmatrix}$$

$n = 3$
$n_0 = 2$
$r = 1$
$c = 3$

$\sigma_\ell = 0.2$
$\sigma_0 = 0.2$
} $W = I_3$

$$F_i = \ell_i - \left[(x - x_i)^2 + (y - y_i)^2\right]^{1/2} = 0 \quad 36\text{-}6$$

$$\frac{\partial F_i}{\partial x} = -\tfrac{1}{2}[\,]^{-\frac{1}{2}} \cdot 2(x - x_i)$$

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

$$\frac{\partial F_i}{\partial y} = \frac{-(y - y_i)}{D_i}$$

$f_i = -F(\ell, x^0)$

B, f, $W = I_3$

3,2 3,1

10^{-1}

$\Delta_s = 10^{-5}$

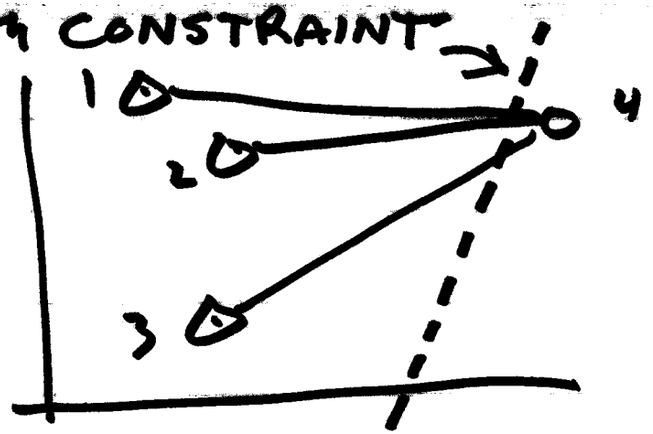
10^{-8}

$\vec{x}$ $\vec{F}$

801.996, 999.874

$$V = \begin{pmatrix} 0.166 \\ -0.258 \\ 0.128 \end{pmatrix}$$

with CONSTRAINT →



unknown point must lie along line

$Y = 3.33333\,X - 1666.667$ ✓

$n = 3$
$n_0 = 1$

$r = 2$
$u = 2$ x_4, y_4
$c = 3$
$s = 1$

$\sigma = a_2$
$\sigma_0 = a_2$
$\Big\}$ $W = I$

$C + S = r + u$

4 ✓ 4

$C_0 = g \rightarrow -F_c(x^0)$

$_{1,1}$

$F_c = y - 3.33333\,x + 1666.667 = 0$

$C = \left[\frac{\partial F_c}{\partial x} \quad \frac{\partial F_c}{\partial y}\right] = \left[-3.33333 \quad 1\right]$

$_{1,2}$

$$\begin{bmatrix} N & C^T \\ C & 0 \end{bmatrix} \begin{bmatrix} \Delta \\ K_c \end{bmatrix} = \begin{bmatrix} -t \\ g \end{bmatrix}$$

Δ's $\begin{cases} 10^0 \\ 10^{-1} \\ 10^{-6} \\ 10^{-8} \end{cases}$

$\hat{x}, \hat{y}$ 800.613, 1002.042

$$V = \begin{bmatrix} -1.550 \\ -1.013 \\ 0.819 \end{bmatrix}$$

Q_{00} SINGULAR !!

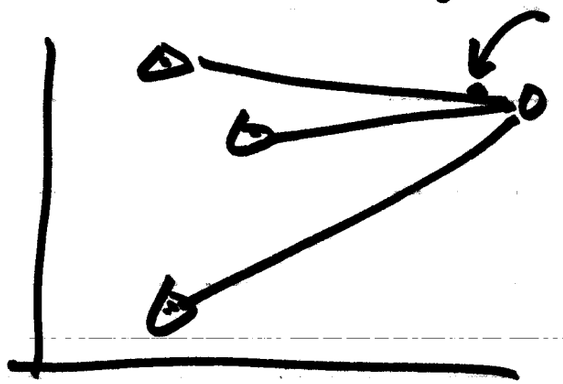
0111

$$F_c = (-g) - 4.5e-13 \approx 0$$

$$\begin{pmatrix} -N & C^T \\ C & 0 \end{pmatrix}^{-1} = \begin{bmatrix} \alpha & \beta^T \\ \beta & \gamma \end{bmatrix}$$

$$Q_{00} = -\alpha$$

another example unified LS



prior knowledge → $x_4 = 801$ $\sigma_x = .05$

$y_4 = 1000$ $\sigma_y = .05$

finish next time ...