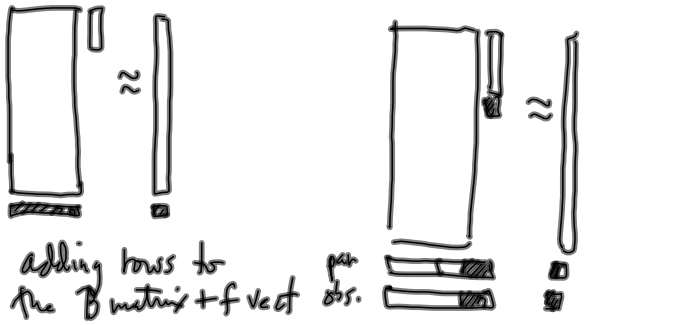
Lecture 41 Seq. CS 41-1




adding terms to the B matrix + f vect

par
obs.

obs: geometry of network
par: relates new par to subset of existing par

↓

time evolution of state vector
dynamics, dynamic model
differential equations
Kalman Filter

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Unified LS : statistics bayesian regression
ridge regression

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purpose: enforce prior knowledge about parameters
value + uncertainty
$x_0$ $\sigma_x$

counting: classical approach

$l : n$
$n_0$
$r : n - n_0$
$u$
$c = r + u$

unified approach

$n' : n + u$
$n_0' : n_0$
$r' : n' - n_0$
$u :$
$c' : n' - n_0 = r'$

you choose

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Example Coord. transf. 2D 41-3

4 par

10 pts. obs. both systems

$n = 20+20 = 40$ | $n' = 20+20+4 = 44$

$n_0 = 4+20 = 24$ | $n_0 = 24$

$r = 16$ | $r' = 20$

$u = 4$ | $u = 4$

$c = r+u = 20$ | $c' = r'+u = 24$ (?)

$A(l+v) + B\Delta = d$

$Av + B\Delta = d - Al = f$

$x + v_x = \Delta$, $v_x - \Delta = -x$

$Av + B\Delta = f$

$Iv_x - I\Delta = -x$

$$\begin{bmatrix} A & 0 \\ 0 & I \end{bmatrix}\begin{bmatrix} v \\ v_x \end{bmatrix} + \begin{bmatrix} B \\ -I \end{bmatrix}\Delta = \begin{bmatrix} f \\ -x \end{bmatrix}, \quad \dot{A}\dot{v} + \dot{B}\Delta = \dot{f}$$

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like GLS 41-4

$$\dot{Q}_e = \dot{A}\begin{bmatrix} Q & 0 \\ 0 & Q_{xx} \end{bmatrix}\dot{A}^T = \begin{pmatrix} A & 0 \\ 0 & I \end{pmatrix}\begin{bmatrix} Q & 0 \\ 0 & Q_{xx} \end{bmatrix}\begin{pmatrix} A^T & 0 \\ 0 & I \end{pmatrix}$$

$$\begin{bmatrix} AQA^T & 0 \\ 0 & Q_{xx} \end{bmatrix} = \dot{Q}_e, \quad \dot{W}_e = \dot{Q}_e^{-1}$$

$$\downarrow$$

$$\begin{pmatrix} Q_e & 0 \\ 0 & Q_{xx} \end{pmatrix}, \quad \dot{W}_e = \begin{pmatrix} W_e & 0 \\ 0 & W_{xx} \end{pmatrix}$$

$\dot{N}\Delta = \dot{t}$, $\dot{N} = \dot{B}^T\dot{W}_e\dot{B}$

$$\begin{bmatrix} B^T & -I \end{bmatrix}\begin{bmatrix} W_e & 0 \\ 0 & W_{xx} \end{bmatrix}\begin{pmatrix} B \\ -I \end{pmatrix} = \dot{N}$$

$= B^T W_e B + W_{xx}$

$\dot{t} = \dot{B}^T\dot{W}_e\dot{f} = \dot{B}^T\dot{W}_e\dot{f} = B^T W_e f + W_{xx}\cdot x$

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$$\Delta = \left(B^T W_e B + W_{xx}\right)^{-1}\left(t + W_{xx}\cdot x\right)$$

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