

Kalman Filter Notes

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DATA SETS

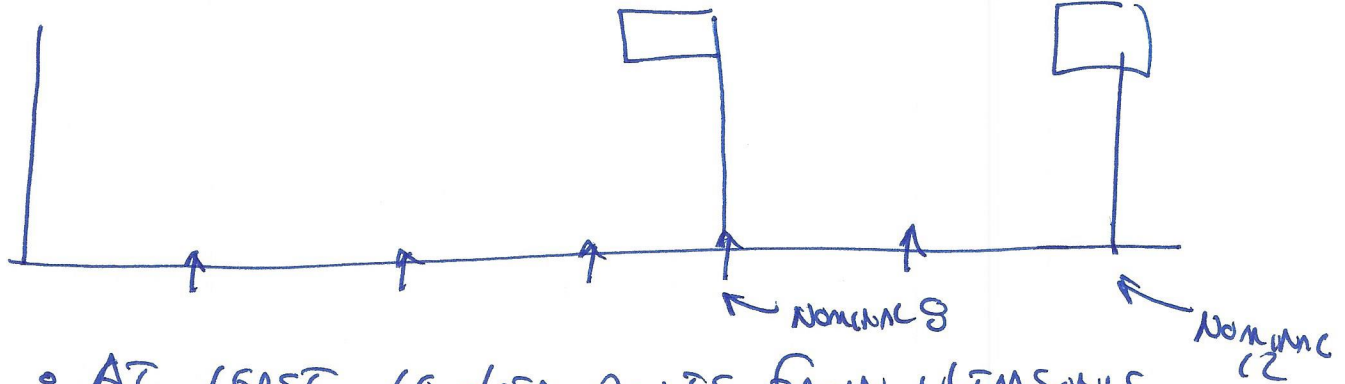
$g(1)$

\vdots

$g(10)$

$12(1)$

$12(10)$



- AT LEAST 10 data points from ultrasonic transducer at each NOMINAL point g , 12 e.g.
- Put transducer at NOMINAL $t \leq \frac{1}{4}$ " measure that ALSO

- Down space col $g(1)$
 \downarrow
 $g(10)$ THEN ACROSS
 AT LEAST 10
 NOMINAL POINTS

Alpha filter

$$T=1 \quad \Delta w = \frac{1}{6} \quad \Delta w^2 = \frac{1}{36}$$

Compare α from given equations

Filter using new (old) DATA from col

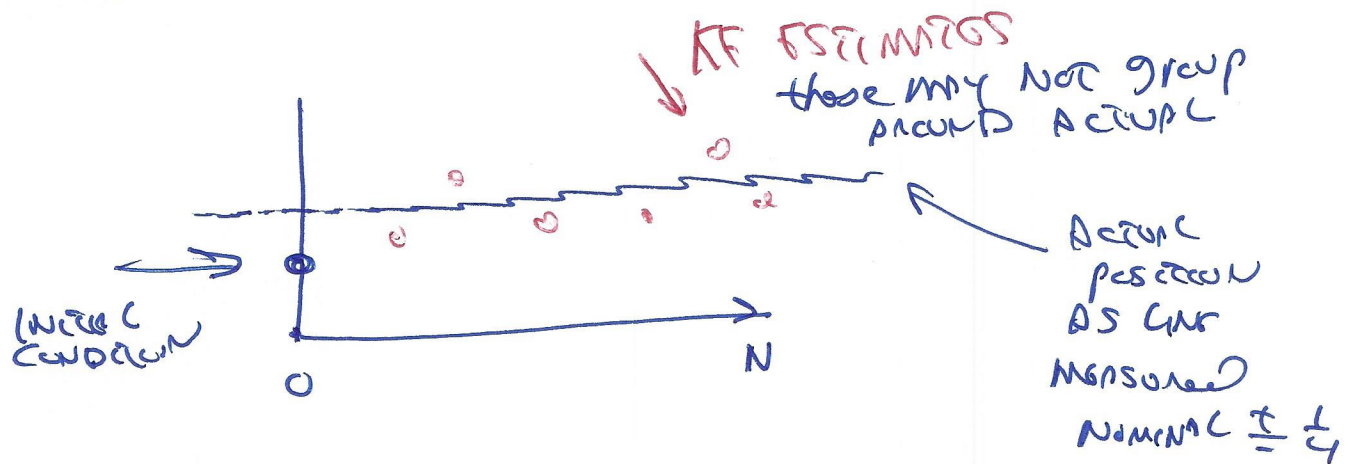
$$\hat{x}_{\text{new}} = \hat{x}_{\text{old}} + \alpha [\text{MEAS} - \hat{x}_{\text{old}}]$$

Runs at least 10 times

You need an I.C
 Pick NOMINAL VALUE "g" or "12"

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YOU NEED AN α -FILTER RUN FOR EACH NOMINAL LOCATION



DO FOR EACH NOMINAL LOCATION

PLOT $\pm 3\sigma$ BASED ON KF OUTPUT
YOU NEED TO COMPUTE
COMPARE TO $\hat{\sigma}_x^2$

α -B FILTER SINGLE BEAM

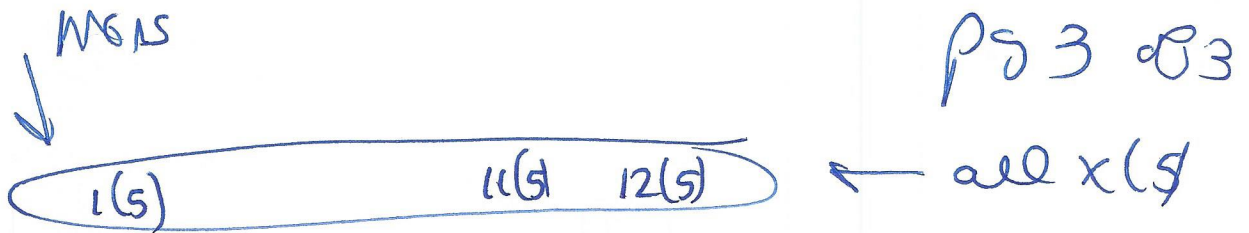
$$\begin{bmatrix} X \\ V \end{bmatrix}_{\text{NEW}} = \begin{bmatrix} 1 & T \\ 0 & 1 \end{bmatrix} \begin{bmatrix} X \\ V \end{bmatrix}_{\text{OLD}} + \begin{bmatrix} \alpha \\ \beta/T \end{bmatrix} \left[\text{MEAS} - \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} X \\ V \end{bmatrix}_{\text{OLD}} \right]$$

$T=1$

YOU NEED TO COMPUTE

α, β FROM DR. KALATA'S PAPER

$\alpha_{\text{AB}} \neq \alpha_x$ of α -FILTER

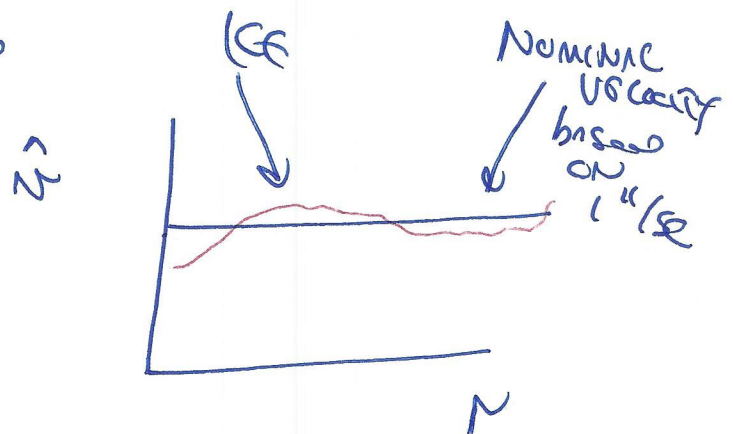
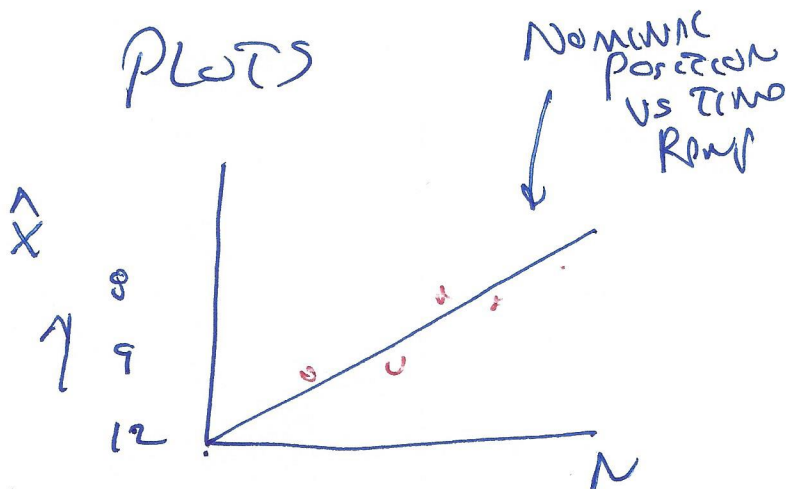


IMPERIAL CONDITION

$V \neq 0$ use velocity corresponding to 1 sec per inch

$X =$ NOMINAL STRUTTING POSITION

PLOTS



Adjust scales etc

START AT 12 ↓ 0 on otherwise

YOU NEED 10 PLOTS
(ACROSS DROP)

Compare results $\Delta \tilde{x}^2$ $\Delta \tilde{v}^2$

to ± 3 std