Handout 10: Notch compensation

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March 5, 2004

Notch Compensation goals: Kill nasty frequencies (eg resonant frequencies).

Canonical Notch element:

\[ K_{\text{notch}}(s) = \frac{(s/\omega)^2 + 2\zeta(s/\omega)s + 1}{(s/\omega + 1)^2} \]

Bode plot of Notch element
General Notch filter format:

\[ K_{notch}(s) = \frac{(s/\omega)^2 + 2\zeta(s/\omega)s + 1}{(s/\omega)^2 + 2\gamma(s/\omega)s + 1} \]

Using Notch Compensation
Plant under study:

\[ G(s) = \frac{s^2 + 1}{s^2(s^2 + 2)} \]

Requirements: Want to have good tracking, decent PM.

Draw physical system and OL transfer function here
Compensation Scheme: Use lead compensation

Phase Margin is

Gain Margin is

BW is
Notch compensation:

Root-locus

Bode diagram
$K=1/62.5 \quad a = 0.02 \quad b = 2$

Bode Diagram

Magnitude (dB)

Phase (deg)

Frequency (rad/sec)
$k = \frac{1}{62.5}$  $a = 0.02$  $b = 2$  $\omega_n = 1.414$  $\zeta = 0.0141$

Bode Diagram

Magnitude (dB)

Phase (deg)

Frequency (rad/sec)