

freqd.gain Transient response design by adjusting the gain

The following design procedure allows us to design for a desired percent overshoot. A similar procedure could be followed to design for a desired damping ratio.

1. Generate open-loop Bode plots with some convenient initial gain K_i .
2. Use either Fig. [freqtime.1](#) or Eq. 6 and Eq. 7 to find the desired phase margin Φ_M .
3. From the Bode phase plot, determine the frequency ω_{Φ_M} at which (180 deg minus the absolute value of) the phase is equal to the desired phase margin.
4. Change the gain to be such that the magnitude plot would intersect 0 dB at ω_{Φ_M} .

Example freqd.gain–1

Design a unity feedback gain controller for a system with the plant

$$G(s) = \frac{10}{(s + 90)(s + 30)}$$

such that the percent overshoot %OS is approximately 20%.

re: Percent overshoot design by adjusting the gain