

Examining some systems

For each of the following systems, plot the root locus using the MATLAB `rlocus` command. Examine the behavior of the poles as K is varied and formulate some general rules about what happens.

$$H(s) = \frac{1}{s+1} \quad (1)$$

$$H(s) = \frac{1}{s^2 + s + 1} \quad (2)$$

$$H(s) = \frac{1}{s^2 + 10s + 1} \quad (3)$$

$$H(s) = \frac{s+1}{(s+10)(s+12)} \quad (4)$$

$$H(s) = \frac{s^2+1}{(s+10)(s+12)} \quad (5)$$

$$H(s) = \frac{s^2+1}{(s+1)(s+10)(s+12)} \quad (6)$$

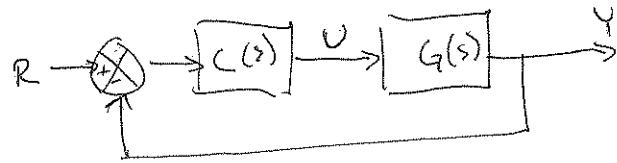
$$H(s) = \frac{s+1}{(s+1)(s+10)(s+12)} \quad (7)$$

$$H(s) = \frac{1}{(s+1)(s+10)(s+12)} \quad (8)$$

Now try creating your own transfer functions and examine their behavior. Can you predict what will happen using your rules?

Why do poles go to the zeros as gain increases?

We've got a TF $\frac{Y(s)}{R(s)} = \frac{C(s)G(s)}{1 + C(s)G(s)}$



Poles are roots of $1 + C(s)G(s)$

Let's define a poly TF $L(s)$ so that the characteristic equation is $1 + KL(s)$

In this (and many) case(s) $L = C(s)G(s)$
Could also write it $\frac{b(s)}{a(s)}$

As $K \rightarrow \infty$, either $b(s) = 0$ (so that $1 + KL(s) = 1 + \frac{b(s)}{a(s)} = 0$)
or $s \rightarrow \infty$ so that $a(s)$ term gets big.

