Computer Exercise 1
EL2520 Control Theory and Practice

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Disturbance attenuation

How should the extra poles be chosen in exercise 4.2.1? Motivate!
They were chosen according to this formula:

$$\frac{1}{\frac{1}{p}s+1}. \tag{1}$$

This formula is used so that lower frequency gain is not changed. As a extra precautionary measure the poles were chosen as $10 \cdot \mathrm{w}_c$, so that lower frequency gain is less affected.

The feedback controller in exercise 4.2.2 is

$$F_y(s) = \frac{10.11s^3 + 242.7s^2 + 4854s + 16180}{s^3 + 179.9s^2 + 8090s}$$

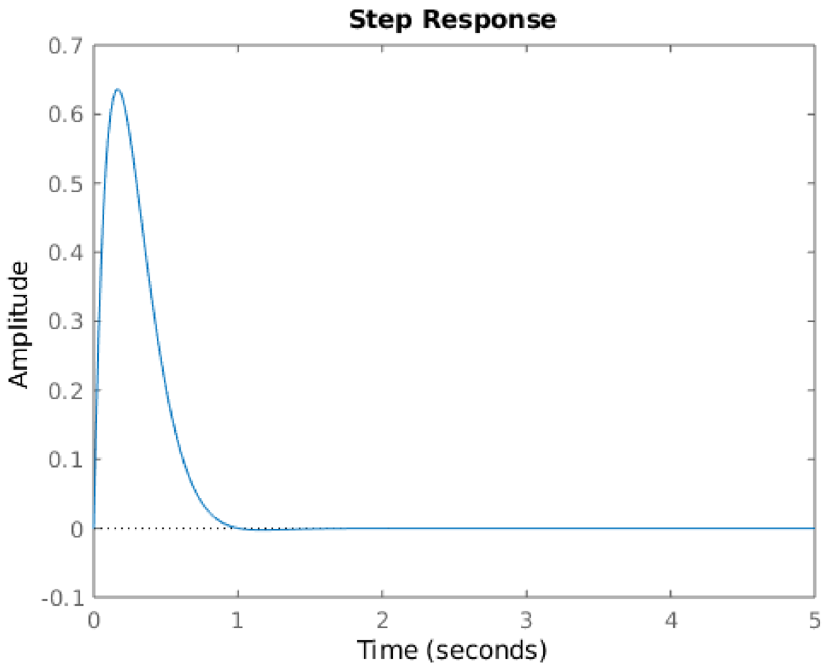

Figure 1: Step disturbance, exercise 4.2.2

The feedback controller and prefilter in exercise 4.2.3 is

$$F_y(s) = \frac{23.12s^4 + 996.7s^3 + 22030s^2 + 255600s + 837500}{s^4 + 230.1s^3 + 16020s^2 + 301500s}$$

$$F_r(s) = \frac{1}{1 + 0.1s}$$

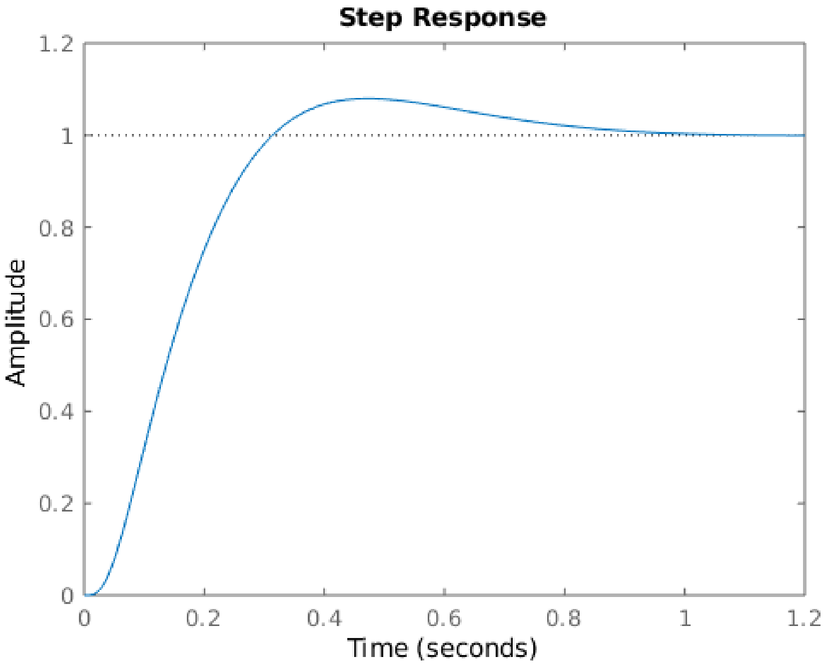

Figure 2: Reference step, exercise 4.2.3

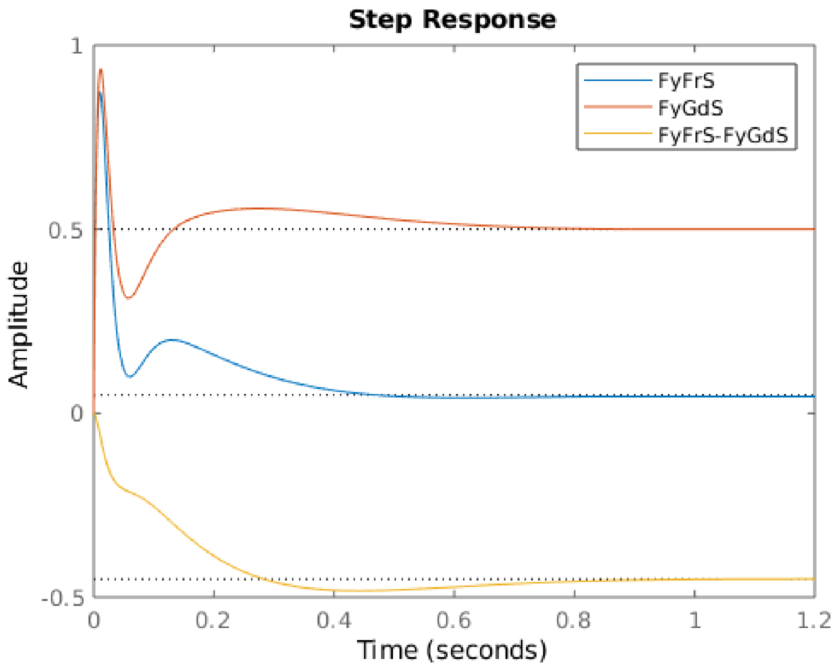

Figure 3: Control signal for a disturbance or a reference step (plus a combination of these)

Did you manage to fulfill all the specifications? If not, what do you think makes the specifications difficult to achieve?

We managed to fulfill all the specifications. The difficulty is that parameters are a trade-off. Fulfilling one specification usually makes another unfulfilled.

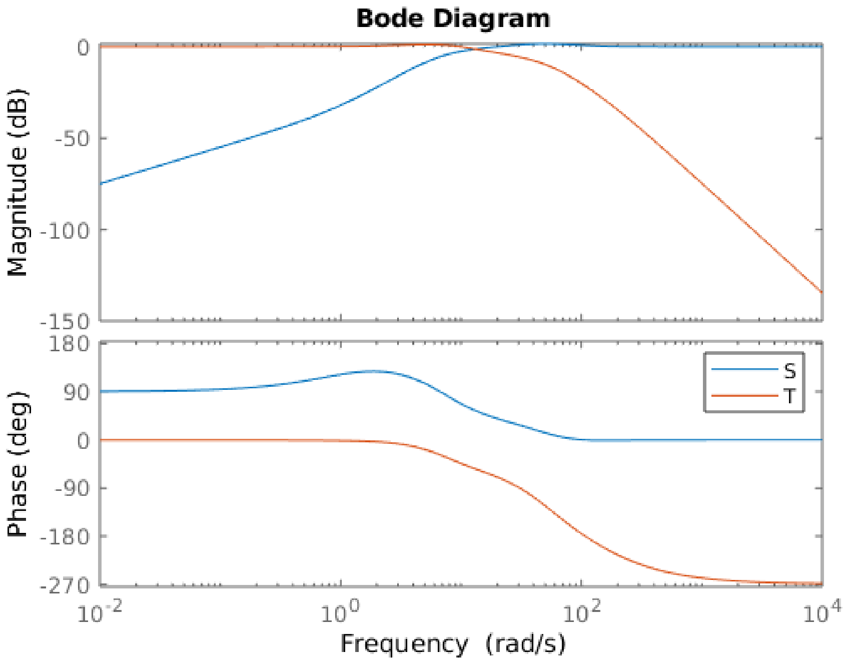

Figure 4: Bode diagram of sensitivity and complementary sensitivity functions, exercise 4.2.4