Control Engineering

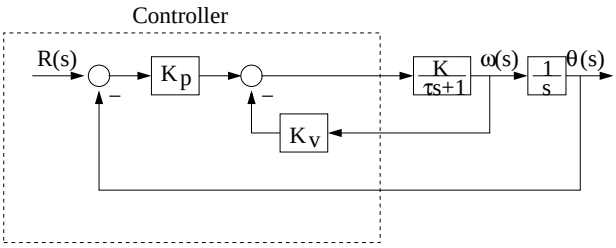
Topics:

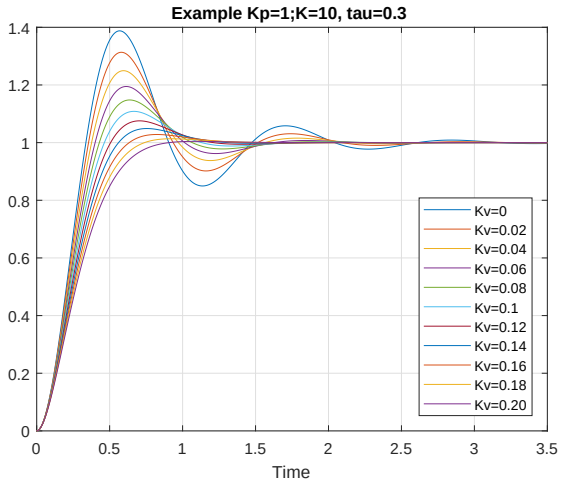
- Cascade control

Exercises:

1. A controller structure like in the laboratory exercise

    - Show that the controller structure gives a second order closed loop system.
    - Show that the overshoot depends on K_v.
    - Show that the bandwidth of the closed loop only depends on K_p





2. A series controlled and a cascade controlled system.

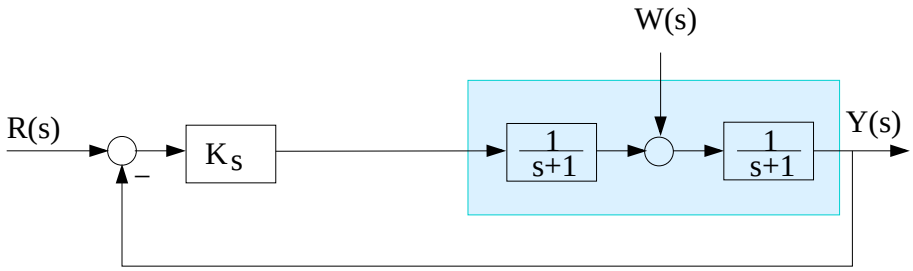


Figure 1: *Series controlled system*

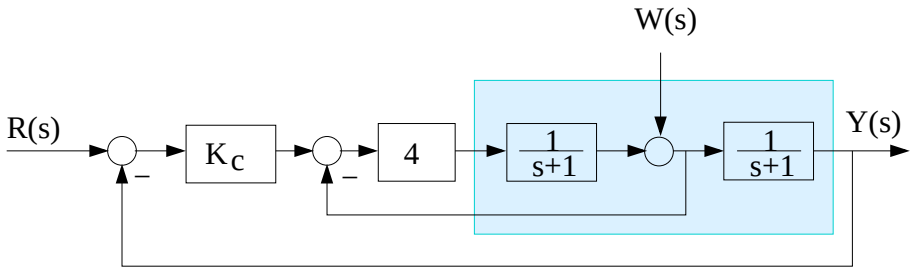


Figure 2: *Cascade controlled system*

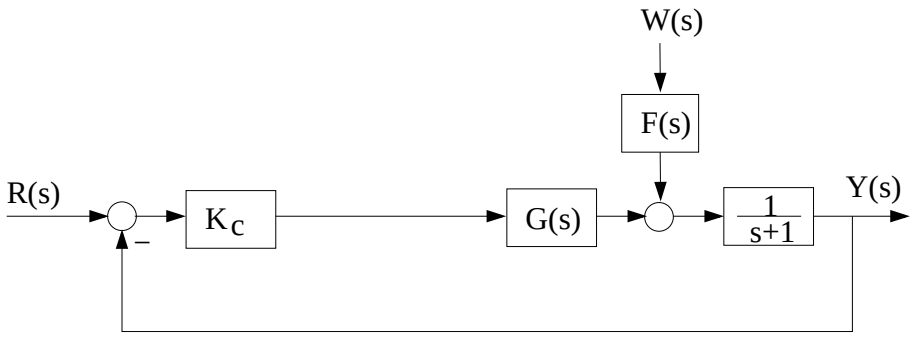


Figure 3: *New representation of the cascade controlled system*

- Find $G(s)$ and $F(s)$ so figure 3 gives the same closed loop transfer functions as figure 2.
- Compare the structure in figure 1 and figure 3. $F(s)$ corresponds to 1 in figure 1. Do you prefer the structure in figure 1 or figure 2, and why? $G(s)$ corresponds to $\frac{1}{s+1}$. Do you prefer the structure in figure 1 or figure 2, and why?

On moodle is a solution to the following exercises.

- Determine for the series controlled system the value of K_s giving an overshoot of 16 % (ζ=0.5). (Result Ks=3)
- On figure 2 a cascade controller with proportional gain of 4 is inserted. Determine K_c giving a overshoot of 16 % (ζ=0.5). (Result Kc= 7.8)
- The two controller have the same overshoot, is the rise times the same? (Calculate the rise times for the two controlled systems)
- The two controller have the same overshoot, is the steady state errors the same? (Calculate the steady state error for the two controlled systems)
- Determine the transfer function from $W(s)$ to $Y(s)$ in the two cases. Using Matlab plot bodeplots of the two transfer function and discuss the two.