Computer Exercise 1
EL2520 Control Theory and Practice

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Suppression of disturbances

The weight is

$$
\begin{aligned}
W_S(s) &= \frac{1}{(s+\epsilon+i\sqrt{\omega^2-\epsilon^2})(s+\epsilon-i\sqrt{\omega^2-\epsilon^2})} \\
&= \frac{1}{(s+0.5+i\sqrt{(100\pi)^2-0.5^2})(s+0.5-i\sqrt{(100\pi)^2-0.5^2})}
\end{aligned}
$$

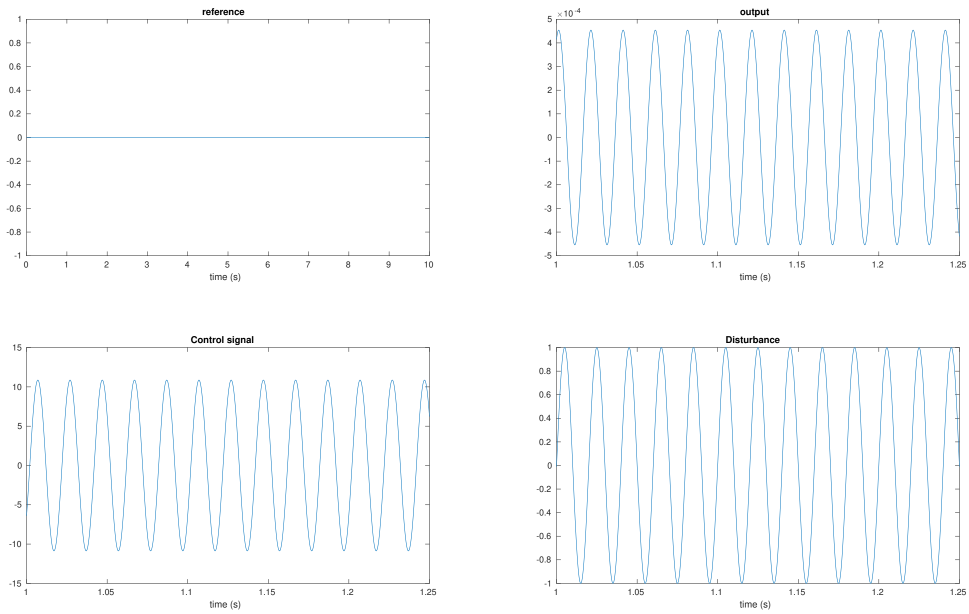

Figure 1: Simulation results with system G, using W_S.

- How much is the disturbance damped on the output?

  The rate between the disturbance amplitude and the output oscillations is 4.543×10^{-4}.

- What amplification is required for a P-controller to get the same performance, and what are the disadvantages of such a controller?

Robustness

What is the condition on T to guarantee stability according to the small gain theorem, and how can it be used to choose the weight W_T?

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The weights are

$$W_S(s) = \dots$$
$$W_T(s) = \dots$$

Is the small gain theorem fulfilled?

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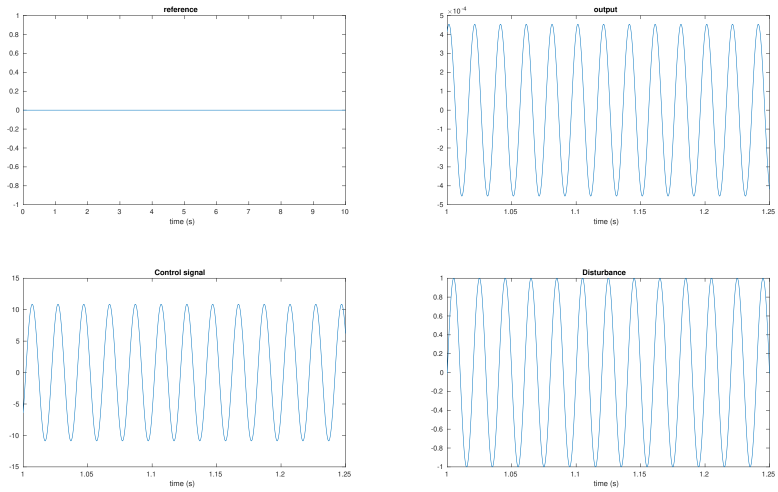

Figure 2: Bode diagram showing that the small gain theorem is satisfied.

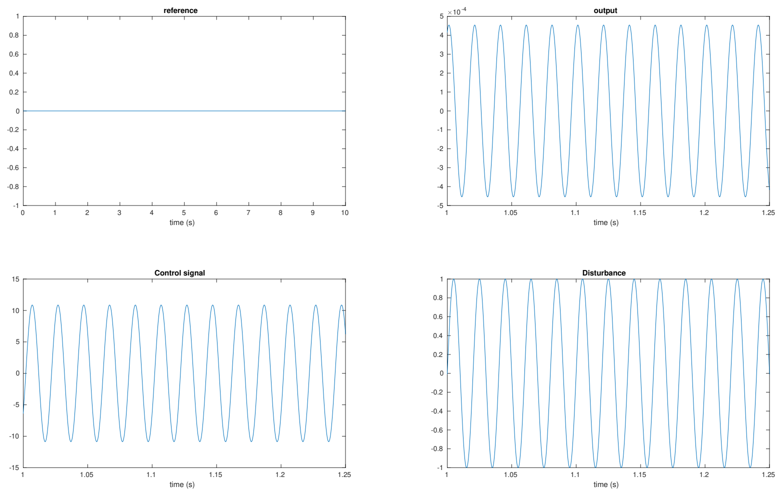

Figure 3: Simulation results with system G_0, using W_S and W_T.

Compare the results to the previous simulation

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Control signal

The weights are

$$W_S(s) = \dots$$
$$W_T(s) = \dots$$
$$W_U(s) = \dots$$

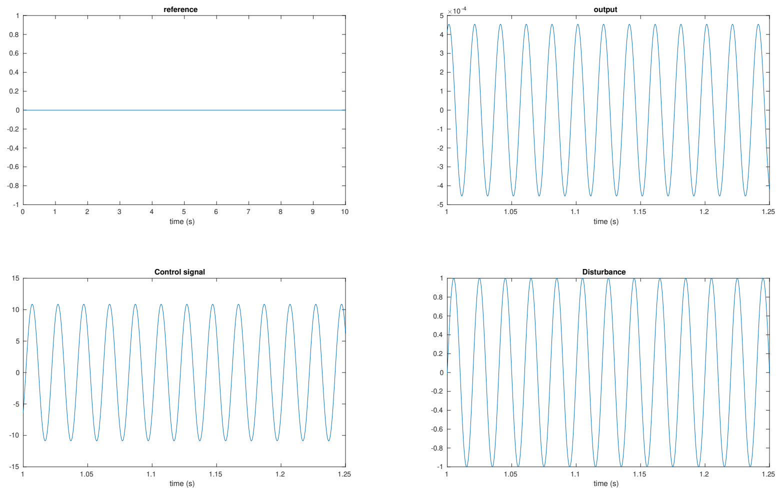

Figure 4: Simulation results with system G_0, using W_S, W_T and W_U.

Compare the results to the previous simulations

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