Computer Exercise 4
EL2520 Control Theory and Practice

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Minimum phase case

Dynamic decoupling

The dynamic decoupling in exercise 3.2.1 is

$$W(s) = \begin{bmatrix} 1 & \dfrac{-0.01336}{s+0.02572} \\ \dfrac{-0.01476}{s+0.0213} & 1 \end{bmatrix}$$

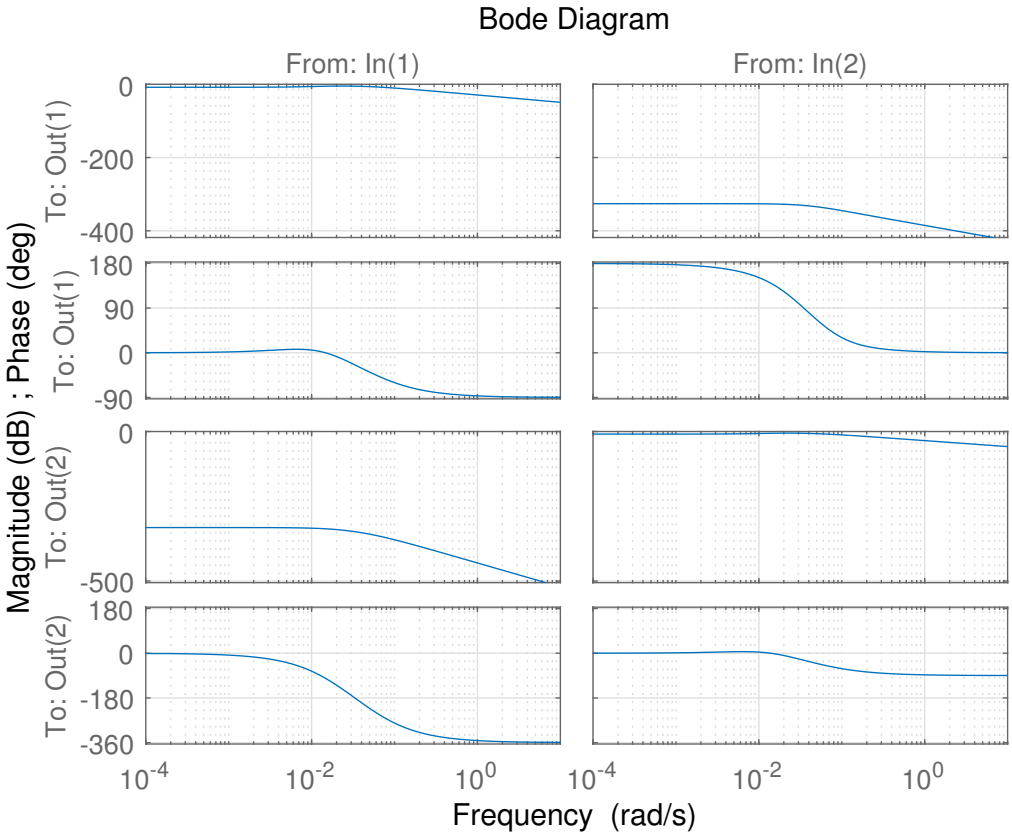

Figure 1: Bode diagram of $\tilde{G}(s)$ derived in exercise 3.2.1

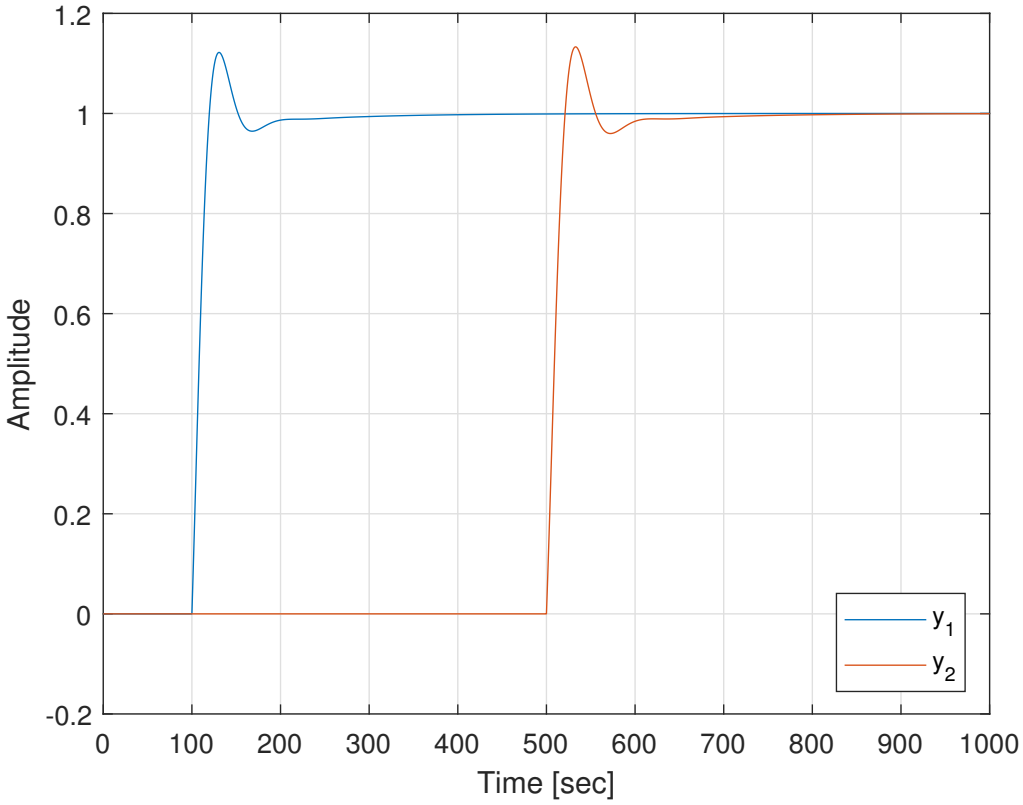

Figure 2: Simulink plots from exercise 3.2.4

- Is the controller good?

  In minimum phase case, u_1 and u_2 should be paired with y_1 and y_2 respectively. From fig 6, u_1 is attenuated for y_2 (which is $\tilde{g}_{1,2}$). Same attenuation for u_2 respect to y_1 (which is $\tilde{g}_{2,1}$). So, the controller is good.

- Are the output signals coupled?

  From fig 2 we can see the step responses of the closed-loop system and it is obvious that, y_1 is influenced by u_1 and y_2 is influenced by u_2. So the output signals are coupled.

Glover-MacFarlane robust loop-shaping

What are the similarities and differences compared to the nominal design?

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Non-minimum phase case

Dynamic decoupling

The dynamic decoupling in exercise 3.2.1 is

$$W(s) = \ldots$$

- Is the controller good?
- Are the output signals coupled?

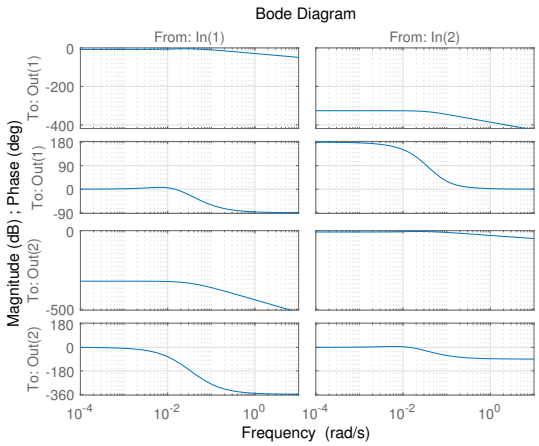

Figure 3: Simulink plots from exercise 3.3.4

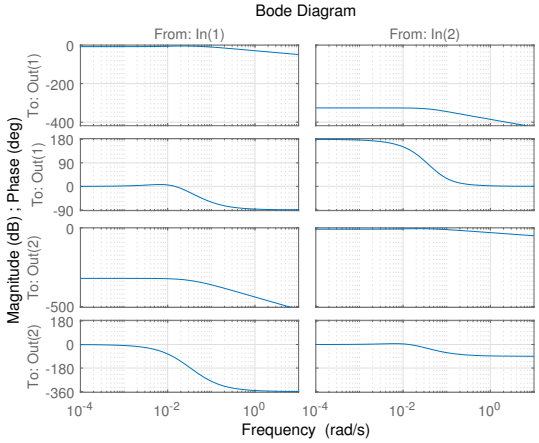

Figure 4: Bode diagram of $\tilde{G}(s)$ derived in exercise 3.2.1

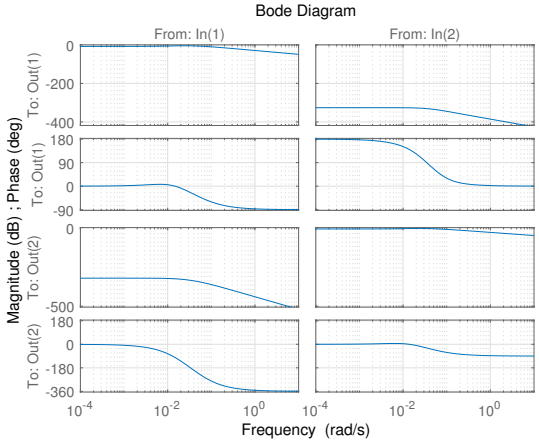

Figure 5: Simulink plots from exercise 3.2.4

Glover-MacFarlane robust loop-shaping

What are the similarities and differences compared to the nominal design?

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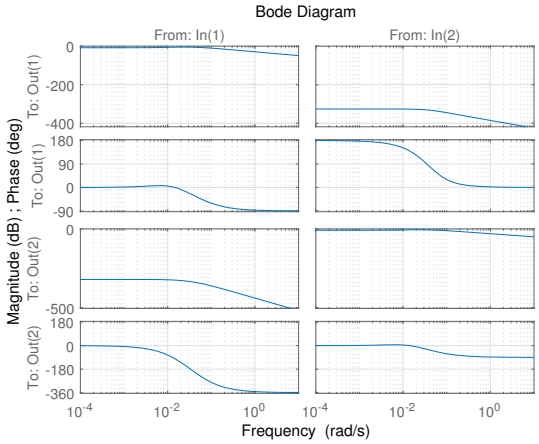

Figure 6: Simulink plots from exercise 3.3.4