Course „Control Systems 2“

Exercise Sheet 11

Task 25:

Consider the LTI SISO system with the state differential equation (see Task 20 on Exercise Sheet 8 and Task 22 on Exercise Sheet 9)

$$\dot{\underline{x}} = \begin{bmatrix} 1 & -4 \\ 2 & -3 \end{bmatrix} \underline{x} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u$$
$$y = [0 \quad 1] \underline{x}$$

We want to implement the state feedback controller designed in Task 22b) by measuring the output signal y only.

a) Determine a suitable Luenberger state observer such that errors between the true and the estimated states decay according to the observer eigenvalues $\lambda_{o,1} = \lambda_{o,2} = -4$.

b) Draw the block diagram of the control-loop consisting of plant, observer (Task 25a) and state-feedback control (Task 22b).

c) What changes if the output equation of the plant also contains a feedthrough term, e.g. if instead of y the signal

$$\bar{y} = [0 \quad 1] \underline{x} + 2u$$

is measured? Modify the block diagram accordingly.