



Homework exercise 2

Value function iteration and MPC

Submission deadline: January 31, 2020

Please use this sheet to fill in your results and hand it in together with the rest of your solution, i.e. your commented written calculations. Notice that giving only the results will not be credited.

Problem 1:

a)

Optimal control problem:

\min

s.t.

Value function iteration:

$$V^{\text{new}}(\xi_1) =$$

$$V^{\text{new}}(\xi_2) =$$

$$V^{\text{new}}(\xi_3) =$$

$$V^{\text{new}}(\xi_4) =$$

$$V^{\text{new}}(\xi_5) =$$

$$V^{\text{new}}(\xi_6) =$$

$$V^{\text{new}}(\xi_7) =$$

$$V^{\text{new}}(\xi_8) =$$

b)

Value function:

$$V^* = [\quad , \quad , \quad , \quad , \quad , \quad , \quad , \quad]^\top \in \mathbb{R}^8$$

Optimal feedback:

$$v_k(\xi_1) =$$

$$v_k(\xi_2) =$$

$$v_k(\xi_3) =$$

$$v_k(\xi_4) =$$

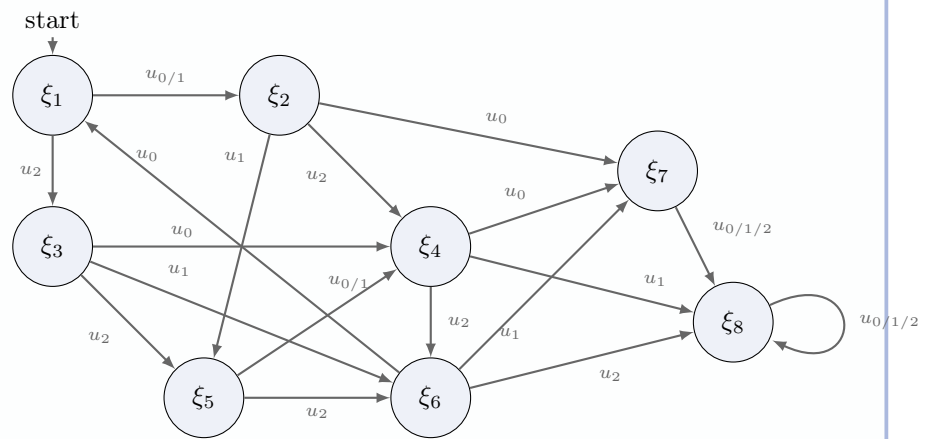
$$v_k(\xi_5) =$$

$$v_k(\xi_6) =$$

$$v_k(\xi_7) =$$

$$v_k(\xi_8) =$$

Optimal input sequence (draw the path):



c) No results have to be filled in.

d) No results have to be filled in.

e)

$$\begin{array}{l}
 c = [\quad \quad \quad]^\top \\
 b = [\quad \quad \quad]^\top \\
 A = \begin{bmatrix} \quad & \quad & \quad \\ \quad & \quad & \quad \\ \quad & \quad & \quad \end{bmatrix} \in \mathbb{R}^{\cdots \times \cdots}
 \end{array}$$

f) No results have to be filled in.

Problem 2:

a)

Equilibrium: $\bar{x}^\top = [\quad , \quad]^\top$
 stable: ☐ yes ☐ no

b)

min

s.t.

c) No results have to be filled in.

d)

$$\begin{array}{ll}
 z = [&]^{\top} & B_{eq} = [&]^{\top} \\
 H = \left[\begin{array}{c} \\ \\ \\ \end{array} \right] & & A_{eq} = \left[\begin{array}{c} \\ \\ \\ \end{array} \right] \\
 A_{ineq} = \left[\begin{array}{c} \\ \\ \\ \end{array} \right] & & T = \left[\begin{array}{c} \\ \\ \\ \end{array} \right] \\
 B_{ineq} = [&]^{\top} & d =
 \end{array}$$

e) No results have to be filled in.

f) No results have to be filled in.

g) No results have to be filled in.