SSY281 - Model Predictive Control
Micro-Homework M01

Lucas Rath

January 24, 2019

Question 1

In order to find the steady-state response of the system, we set $x(k+1) = x(k)$ and $u(k)$ constants to be determined:

$$\begin{aligned} x(k) &= A \cdot x(k) + B \cdot u(k) \\ y(k) &= 1 = C \cdot x(k) \end{aligned} \tag{1}$$

Using Matlab, we can solve this equations (3 equations, 3 variables) as follows:

Listing 1: *caption*

```
x = sym('x',[2,1]);
syms u
ys = 1;

A = [0.5 0.2; -0.2 0.5];
B = [0; 1];
C = [1 0];

eq = [x == A*x + B*u;
      ys == C*x];

answ = solve(eq);

fprintf('Steady states x_{ss}=[%.2f %.2f], u_{ss}=[%.2f]\n', answ.x1, answ.x2, answ.u)
```

Leading to the following results:

$$\begin{aligned} x_s &= [1.00 \quad 2.50]^T \\ u_s &= [1.45] \end{aligned} \tag{2}$$