
```
% MECH 6327 - Homework 5
% Author: Jonas Wagner
% Date: 2020-05-02
```

```
clear
close all
```

```
% System Definition
MECH6327_HW5_sys_def
```

```
% Problem 1
MECH6327_HW5_pblm1
% Problem 2
MECH6327_HW5_pblm2
```

```
sys =
```

```
A =
      x1      x2      x3      x4
x1 -1.282      0    0.98      0
x2      0      0      1      0
x3 -5.492      0 -1.837      0
x4 -128.2  128.2      0      0
```

```
B =
      u1
x1 -0.3
x2      0
x3 -17
x4      0
```

```
C =
      x1  x2  x3  x4
y1      0   1   0   0
y2      0   0   0   1
y3      0   0   0   0
```

```
D =
      u1
y1      0
y2      0
y3      1
```

Continuous-time state-space model.

```
sys =
```

```
A =
      x1      x2      x3      x4
x1 -1.282      0    0.98      0
x2      0      0      1      0
```

x3	-5.492	0	-1.837	0
x4	-128.2	128.2	0	0

B =

	u1
x1	-0.3
x2	0
x3	-17
x4	0

C =

	x1	x2	x3	x4
y1	0	1	0	0
y2	0	0	0	1
y3	0	0	0	0

D =

	u1
y1	0
y2	0
y3	1

Continuous-time state-space model.

K_H2 =

-44.6546	56.8903	1.7838	1.0000
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Norm_H2 =

0.5000

K_Hinfty =

1.0e+05 *			
-0.9457	1.1643	0.0299	0.0281

Norm_Hinfty =

0.1330

sys =

A =

	x1	x2	x3	x4
x1	-1.282	0	0.98	0
x2	0	0	1	0
x3	-5.492	0	-1.837	0

x4	-128.2	128.2	0	0
----	--------	-------	---	---

B =

	u1
x1	-0.3
x2	0
x3	-17
x4	0

C =

	x1	x2	x3	x4
y1	0	1	0	0
y2	0	0	0	1
y3	0	0	0	0

D =

	u1
y1	0
y2	0
y3	1

Continuous-time state-space model.

sys =

A =

	x1	x2	x3	x4
x1	0.6123	1.966e-16	0.1569	0
x2	-0.1295	1	0.1903	0
x3	-0.8792	-1.63e-16	0.5236	0
x4	-27.57	32.05	0.4086	1

B =

	u1
x1	-1.556
x2	-1.783
x3	0.161
x4	3.84

C =

	x1	x2	x3	x4
y1	0	1	0	0
y2	0	0	0	1
y3	0	0	0	0

D =

	u1
y1	0
y2	0
y3	1

Sample time: 0.25 seconds

Discrete-time state-space model.

$K_{LQR} =$

2.6795 -3.6639 -0.1890 -0.0447

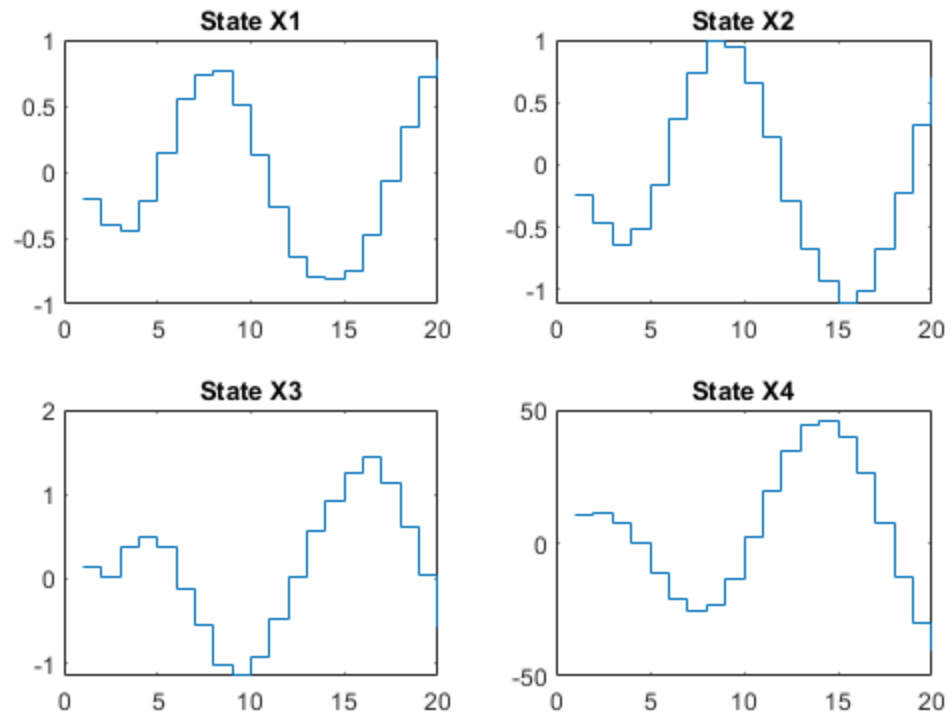
----- MPC Method: -----

Iteraton: 1
Iteraton: 2
Iteraton: 3
Iteraton: 4
Iteraton: 5
Iteraton: 6
Iteraton: 7
Iteraton: 8
Iteraton: 9
Iteraton: 10
Iteraton: 11
Iteraton: 12
Iteraton: 13
Iteraton: 14
Iteraton: 15
Iteraton: 16
Iteraton: 17
Iteraton: 18
Iteraton: 19
Iteraton: 20

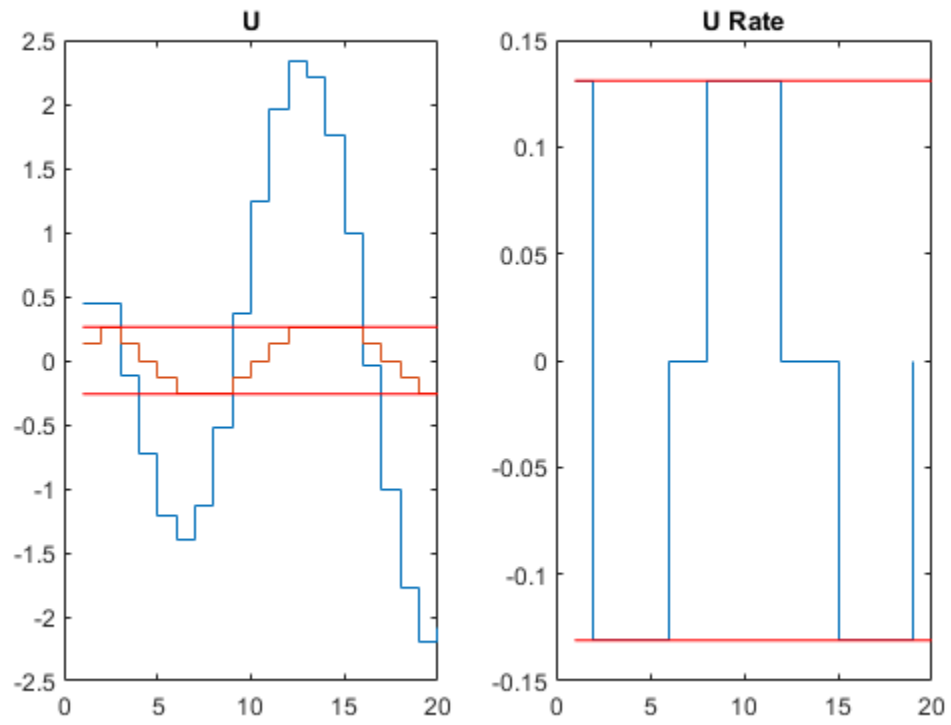
MPC_runtime =

13.3935

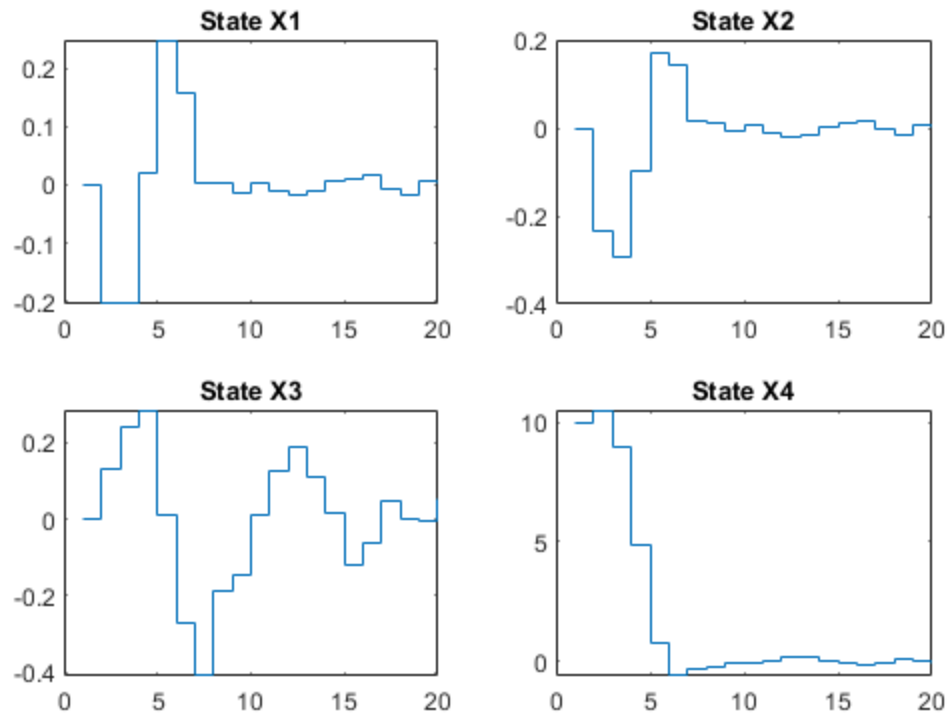
LQR Method System Response



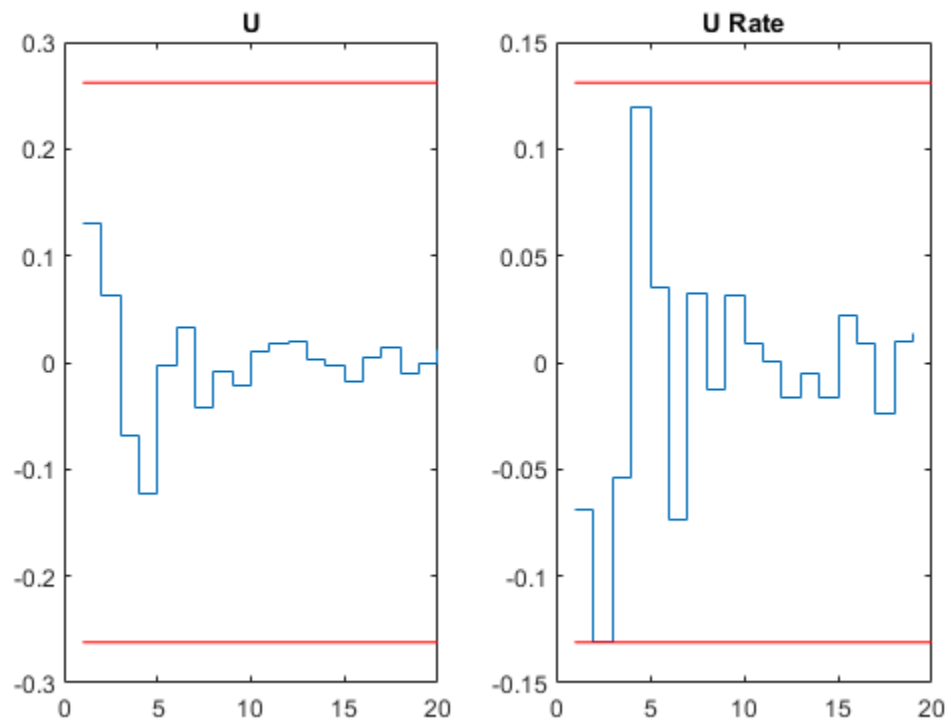
LQR Method Control Signal



MPC Method System Response $T = 10$



MPC Method Control Signal $T = 10$



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