

```

>> load('C:\Users\Gyulai ✓
László\Documents\thesis\model\toMPC\mpc_model_and_initial_controller.mat' )
>> load('C:\Users\Gyulai ✓
László\Documents\thesis\model\components\ident_tulhomerseklet_valve_in_temp ✓
_out_allsimscape_initialzeroenergy.mat' )
>> sys3=tf(tf_to_MPC)
Error using tf (line 287)
In the "tf(M)" command, M must be a numeric array.

>> tf_to_MPC

tf_to_MPC =

Time domain data set with 86401 samples.
Sample time: 60 seconds

Outputs          Unit (if specified)
    y1

Inputs           Unit (if specified)
    u1
    u2
    u3

>> mpc_control_slab=mpc(tf19,1)
-->Converting linear model from System Identification Toolbox to state- ✓
space.
-->The "PredictionHorizon" property of "mpc" object is empty. Trying ✓
PredictionHorizon = 10.
-->The "ControlHorizon" property of the "mpc" object is empty. Assuming 2.
-->The "Weights.ManipulatedVariables" property of "mpc" object is empty. ✓
Assuming default 0.00000.
-->The "Weights.ManipulatedVariablesRate" property of "mpc" object is ✓
empty. Assuming default 0.10000.
-->The "Weights.OutputVariables" property of "mpc" object is empty. ✓
Assuming default 1.00000.

MPC object (created on 30-Oct-2018 20:45:13):
-----
Sampling time:      1 (seconds)
Prediction Horizon: 10
Control Horizon:    2

Plant Model:
-----
    3 manipulated variable(s)  -->|  8 states  |
                                |              |-->  1 measured output ✓
(s)

```

```

      0 measured disturbance(s)  -->|  3 inputs  |
                                   |          |-->  0 unmeasured ✓
output(s)
      0 unmeasured disturbance(s) -->|  1 outputs |
                                   -----

```

#### Disturbance and Noise Models:

```

      Output disturbance model: default (type "getoutdist ✓
(mpc_control_slab)" for details)
      Measurement noise model: default (unity gain after scaling)

```

#### Weights:

```

      ManipulatedVariables: [0 0 0]
      ManipulatedVariablesRate: [0.1000 0.1000 0.1000]
      OutputVariables: 1
      ECR: 100000

```

```

State Estimation: Default Kalman Filter (type "getEstimator ✓
(mpc_control_slab)" for details)

```

#### Unconstrained

```

>> mpc_control_slab=setmpcsignals(mpc_control_slab, 'Manipulated',[2✓
3], 'MeasuredDisturbances',1)

```

```

Error using setmpcsignals (line 39)
The first input argument of the
"setmpcsignals" command must be a
non-empty "lti" object.

```

```

>> tf_19_toMPC=setmpcsignals(tf_19, 'Manipulated',[2✓
3], 'MeasuredDisturbances',1)
Undefined function or variable 'tf_19'.

```

Did you mean:

```

>> tf_19_toMPC=setmpcsignals(tf19, 'Manipulated',[2✓
3], 'MeasuredDisturbances',1)

```

tf\_19\_toMPC =

From input "u1" to output "y1":

$3.776e-05 s^2 + 5.958e-09 s + 8.529e-15$

-----

$s^3 + 0.002341 s^2 + 9.301e-09 s$

$+ 8.241e-15$

From input "u2" to output "y1":

$$7.74 \text{ s} + 0.000236$$

$$\begin{aligned} & s^4 + 1.269e04 \text{ s}^3 + 4262 \text{ s}^2 + 3.299 \text{ s} \\ & + 8.454e-06 \end{aligned}$$

From input "u3" to output "y1":

$$6.361e-05$$

$$s + 2.637e-06$$

Input groups:

Name	Channels
Manipulated	2,3
Measured	1

Output groups:

Name	Channels
Measured	1

Name: tf19

Continuous-time identified transfer function.

Parameterization:

Number of poles: [3 4 1]    Number of zeros: [2 1 0]

Number of free coefficients: 14

Use "tfdata", "getpvec", "getcov" for parameters and their uncertainties. ✓

Status:

Estimated using TFEST on time domain data "tf\_3inlout\_\_68d".

Fit to estimation data: 82.28% (stability enforced)

FPE: 1.707, MSE: 1.706

>> tf\_19\_toMPC=setmpcsignals(tf19, 'Manipulated',[2 ✓  
3], 'MeasuredDisturbances',1)

tf\_19\_toMPC =

From input "u1" to output "y1":

$$3.776e-05 \text{ s}^2 + 5.958e-09 \text{ s} + 8.529e-15$$

$$s^3 + 0.002341 \text{ s}^2 + 9.301e-09 \text{ s} + 8.241e-15$$

From input "u2" to output "y1":  
 $7.74 s + 0.000236$

-----  
 $s^4 + 1.269e04 s^3 + 4262 s^2 + 3.299 s + 8.454e-06$

From input "u3" to output "y1":  
 $6.361e-05$

-----  
 $s + 2.637e-06$

Input groups:

Name	Channels
Manipulated	2,3
Measured	1

Output groups:

Name	Channels
Measured	1

Name: tf19

Continuous-time identified transfer function.

Parameterization:

Number of poles: [3 4 1]    Number of zeros: [2 1 0]

Number of free coefficients: 14

Use "tfdata", "getpvec", "getcov" for parameters and their ✓  
uncertainties.

Status:

Estimated using TFEST on time domain data "tf\_3inlout\_\_68d".

Fit to estimation data: 82.28% (stability enforced)

FPE: 1.707, MSE: 1.706

>> tf\_19\_toMPC=setmpcsignals(tf19, 'Manipulated',[2 ✓  
3], 'MeasuredDisturbances',1)

tf\_19\_toMPC =

From input "u1" to output "y1":  
 $3.776e-05 s^2 + 5.958e-09 s + 8.529e-15$

-----  
 $s^3 + 0.002341 s^2 + 9.301e-09 s + 8.241e-15$

From input "u2" to output "y1":  
 $7.74 s + 0.000236$

-----  
 $s^4 + 1.269e04 s^3 + 4262 s^2 + 3.299 s + 8.454e-06$

From input "u3" to output "y1":

```

6.361e-05
-----
s + 2.637e-06

```

Input groups:

Name	Channels
Manipulated	2,3
Measured	1

Output groups:

Name	Channels
Measured	1

Name: tf19

Continuous-time identified transfer function.

Parameterization:

Number of poles: [3 4 1]    Number of zeros: [2 1 0]

Number of free coefficients: 14

Use "tfdata", "getpvec", "getcov" for parameters and their ✓  
uncertainties.

Status:

Estimated using TFEST on time domain data "tf\_3in1out\_\_68d".

Fit to estimation data: 82.28% (stability enforced)

FPE: 1.707, MSE: 1.706

>>

>>

>> mpc\_control\_slab=mpc(tf\_19\_toMPC,1)

-->Converting linear model from System Identification Toolbox to state- ✓  
space.

-->The "PredictionHorizon" property of "mpc" object is empty. Trying ✓  
PredictionHorizon = 10.

-->The "ControlHorizon" property of the "mpc" object is empty. Assuming 2.

-->The "Weights.ManipulatedVariables" property of "mpc" object is empty. ✓  
Assuming default 0.00000.

-->The "Weights.ManipulatedVariablesRate" property of "mpc" object is ✓  
empty. Assuming default 0.10000.

-->The "Weights.OutputVariables" property of "mpc" object is empty. ✓  
Assuming default 1.00000.

MPC object (created on 30-Oct-2018 20:51:50):

```

-----
Sampling time:      1 (seconds)
Prediction Horizon: 10
Control Horizon:   2

```

Plant Model:

```

                -----
2 manipulated variable(s)  -->|  8 states  |
                        |              |-->  1 measured output ✓
(s)
1 measured disturbance(s)  -->|  3 inputs  |
                        |              |-->  0 unmeasured ✓
output(s)
0 unmeasured disturbance(s) -->|  1 outputs |
                -----

```

## Indices:

```

(input vector)    Manipulated variables: [2 3 ]
                  Measured disturbances: [1 ]
(output vector)   Measured outputs: [1 ]

```

## Disturbance and Noise Models:

```

    Output disturbance model: default (type "getoutdist ✓
(mpc_control_slab)" for details)
    Measurement noise model: default (unity gain after scaling)

```

## Weights:

```

    ManipulatedVariables: [0 0]
    ManipulatedVariablesRate: [0.1000 0.1000]
    OutputVariables: 1
    ECR: 100000

```

```

State Estimation: Default Kalman Filter (type "getEstimator ✓
(mpc_control_slab)" for details)

```

## Unconstrained

```

>> mpc_control_slab.ManipulatedVariables(1).Min = 0;
>> mpc_control_slab.ManipulatedVariables(2).Min = 0;
>> mpc_control_slab.ManipulatedVariables(2).Max = 1;
mpc_control_slab.ManipulatedVariables(1).Max = 1;
>> mpc_control_slab.ManipulatedVariables(2).RateMin = 1/60;
Error using mpc/subsasgn (line 479)
"ManipulatedVariables(2).RateMin" must be non-positive.

>> mpc_control_slab.ManipulatedVariables(1).RateMin = 1/60;
Error using mpc/subsasgn (line 479)
"ManipulatedVariables(1).RateMin" must be non-positive.

>> mpc_control_slab.ManipulatedVariables(1).RateMin = -1>60;
Error using mpc/subsasgn (line 479)
"ManipulatedVariables(1).RateMin" must be real valued.

>> mpc_control_slab.ManipulatedVariables(1).RateMin = -1/60;
>> mpc_control_slab.ManipulatedVariables(2).RateMin = -1/60;
>> mpc_control_slab.ManipulatedVariables(2).RateMax = 1/60;

```

```
>> mpc_control_slab.ManipulatedVariables(1).RateMax = 1/60;  
>> mpc_control_slab.ManipulatedVariables(1).Min = [];  
>> mpc_control_slab.ManipulatedVariables(1).Min = 0;  
>>
```