

Assignment #1 : System Identification and PID Control

m-code: mcodes/sysid/sysidl.m

Electronic Control Systems

Dept. of Electronic and Telecommunication Engineering, University of Moratuwa

Task: Use your own transfer function G of order greater than 2 with at least one zero to generate input and output data (u , y). Determine a PID controller for the estimated plant G_s . Visualize step response of the controlled plant.

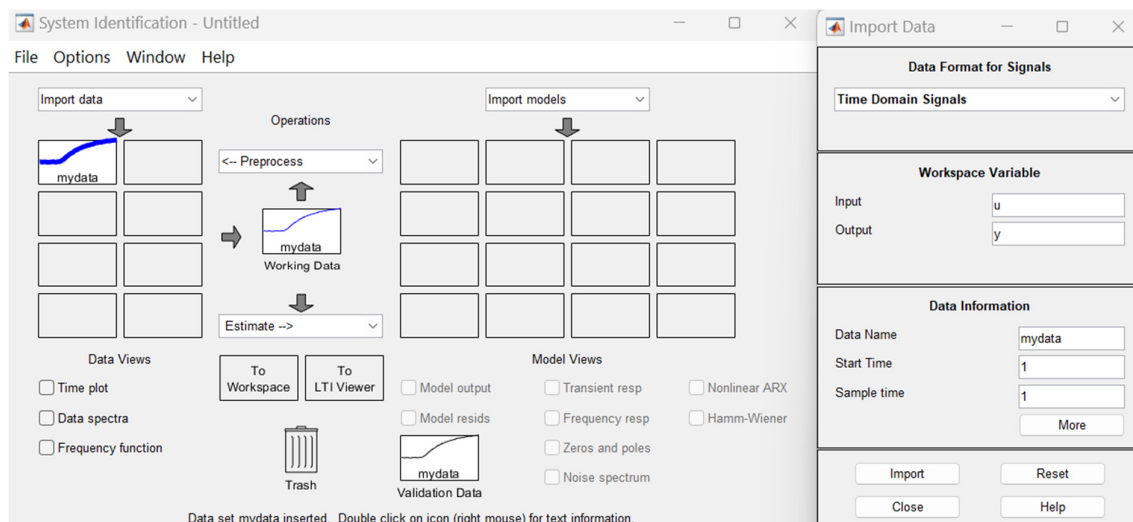
Steps to follow

1. Input and output data generation for a given plant

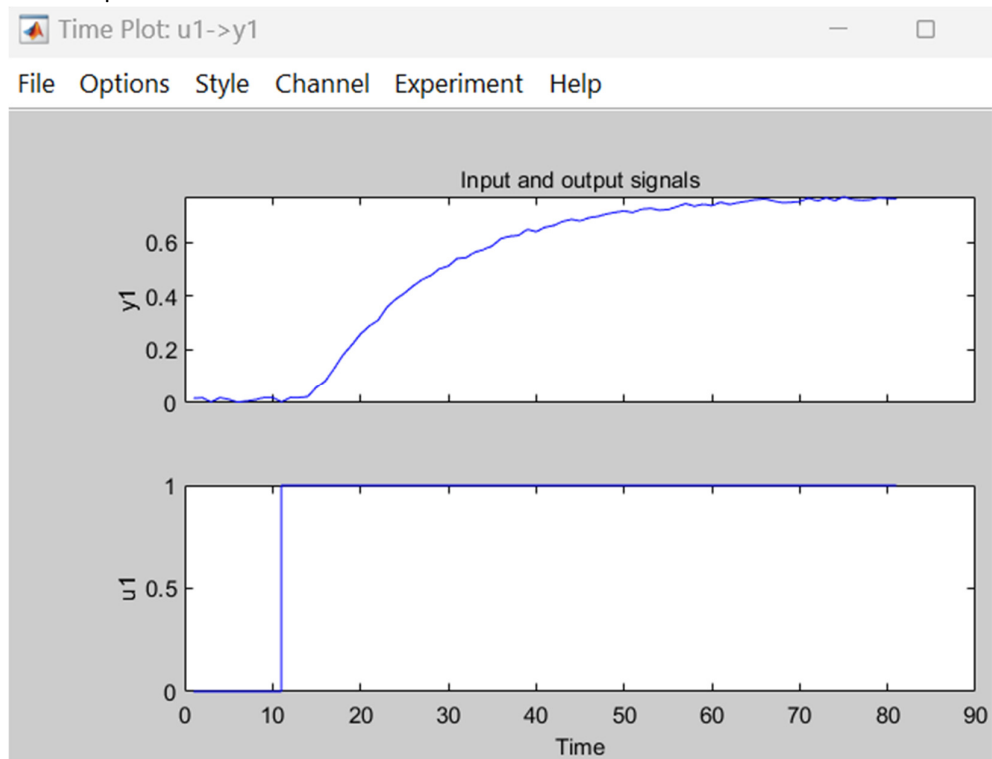
```
clc; close all; clear;
s = tf('s');
G =                                     <= write your transfer function for data generation
dt =                                   <= set your sampling interval
t = 0:dt:8;
u = ones(length(t),1);
u(1:10)=0; % this sets the first 10 samples to zero
y = lsim(G,u,t); % this generates the plant response for input u
y = y + rand(length(t),1)*0.02; % add random noise to the response
plot(t,[u,y]); axis([0 8 0 1.2]);
```

2. Use input and output data in the “system identification App” to estimate plant transfer function $G(s)$

- Open System Identification App in Matlab and do the following referring to the screenshot
 - Select “import time” – “Time domain data”
 - set input “u” and output “y”
 - set start time and sampling interval.



- iv. Check time plot, visualize data, and confirm the generated data has been properly imported.



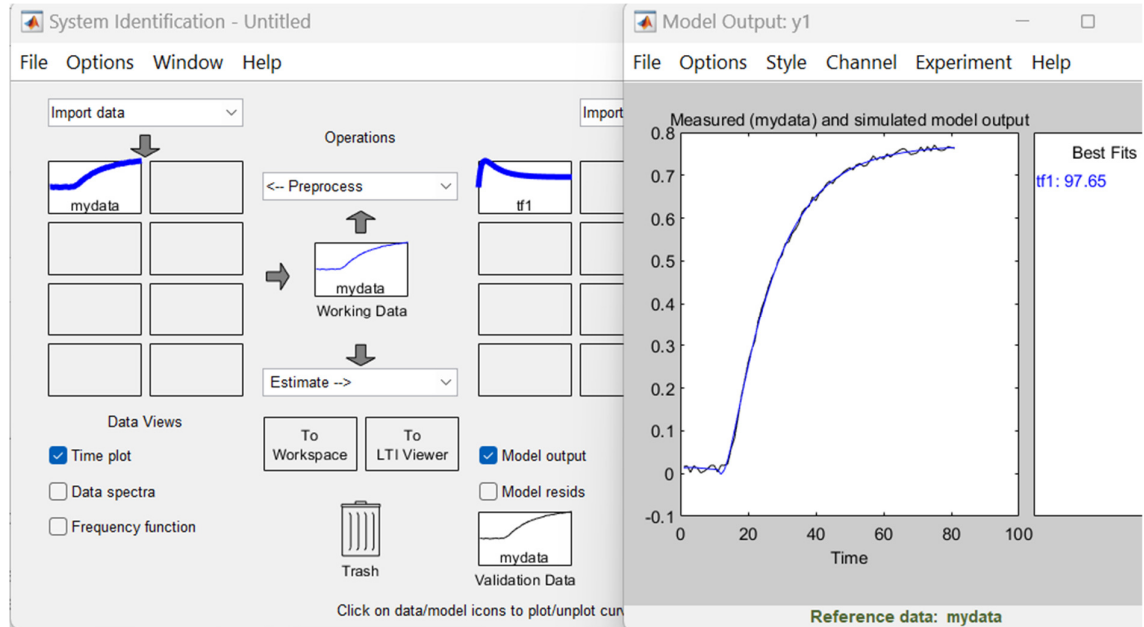
- b. In the estimate area, select transfer function models, select number of poles and zeros, select continuous time, set delay. Click "estimate"

The "Estimate Transfer Functions" dialog box is shown with the "Estimation Options" tab selected. The "Model name" is set to "tf2". Under "Orders and Domain", the "Number of poles" is 2 and the "Number of zeros" is 1. The "Continuous-time" radio button is selected, and the "Feedthrough" checkbox is unchecked. The "Delay" section is expanded, showing "Output: y1". A table below lists the delay settings for input "u1":

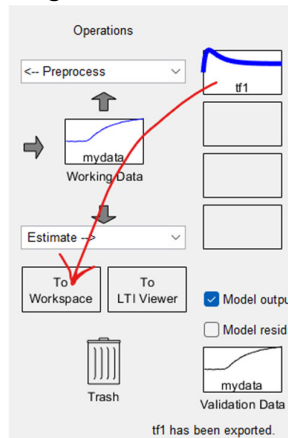
Input	Delay	Fixed	Min	Max
u1	0	<input checked="" type="checkbox"/>	0	30

Buttons for "Help", "Estimate", and "Close" are located at the bottom of the dialog.

- c. Check how closely the model output fits with the actual data.



- d. Bring the modelled transfer function to workspace (drag and drop)



- e. Compare and comment on the actual plant (used for data generation) and the one Matlab estimated based on the input-output data. Pay attention to the poles, zeros, and gains.