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Main function for stiffness ID use data 0721

```
clear all
close all
clc
```

Initialize the system

```
par_set=[];
%flag for EOM deriviation
par_set.EOM=0;
%flag for plot
par_set.flag_plot_rawData = 0;
%flag for read txt file or mat file 1: txt 0: mat
par_set.flag_read_exp = 1;
%flag for plotting moving constant layer
par_set.flag_plot_movingCC =0;
%flag for plotting fwd kinematic results
par_set.plot_fwdKinematic =0;
% p1 < p2,3
% par_set.trial_4_25psi=[];
% par_set.trial_3_25psi=[];
% par_set.trial_2_25psi=[];
% par_set.trial_1_25psi=[];
% par_set.trial_0_25psi=[];
% p1 > p2,3
par_set.trial_25_0psi=[];
par_set.trial_25_1psi=[];
par_set.trial_25_2psi=[];
par_set.trial_25_3psi=[];


% Geometric para.
par_set.trianlge_length=70*1e-03;% fabric triangle edge length
par_set.L=0.19;%actuator length
par_set.n=4;% # of joints for augmented rigid arm
par_set.m0=0.35;%kg segment weight
par_set.g=9.8;%% gravity constant
par_set.a0=15*1e-03;%% 1/2 of pillow width
par_set.r_f=sqrt(3)/6*par_set.trianlge_length+par_set.a0; % we assume
 the force are evenly spread on a cirlce with radius of r_f
```

Update location of 3 chambers P1, P2, P3

```
par_set.p1_angle=-150;%deg p1 position w/ the base frame
% update force position of p1 p2 and p3
for i =1:3
    par_set.r_p{i}=[par_set.r_f*cosd(par_set.p1_angle
+120*(i-1)),par_set.r_f*sind(par_set.p1_angle+120*(i-1)),0].';
%     par_set.f_p{i}=588.31*par_set.pm_MPa(:,i+1);
end
fprintf('System initialization done \n')
```

```
System initialization done
```

Read txt file or mat file

```
if par_set.flag_read_exp==1
%
 par_set.trial_0_25psi=func_high_level_exp(par_set.trial_0_25psi,2);
%
 par_set.trial_4_25psi=func_high_level_exp(par_set.trial_4_25psi,10);
%
 par_set.trial_3_25psi=func_high_level_exp(par_set.trial_3_25psi,9);
%
 par_set.trial_2_25psi=func_high_level_exp(par_set.trial_2_25psi,8);
%
 par_set.trial_1_25psi=func_high_level_exp(par_set.trial_1_25psi,7);



 par_set.trial_25_0psi=func_high_level_exp(par_set.trial_25_0psi,1);
%
 par_set.trial_25_4psi=func_high_level_exp(par_set.trial_25_4psi,6);

 par_set.trial_25_3psi=func_high_level_exp(par_set.trial_25_3psi,4);

 par_set.trial_25_2psi=func_high_level_exp(par_set.trial_25_2psi,3);

 par_set.trial_25_1psi=func_high_level_exp(par_set.trial_25_1psi,2);

    save('raw_id_data.mat','par_set');
    fprintf( 'Saved \n' )
else
    fprintf( 'Loading... \n' );
    load('raw_id_data.mat');
    fprintf( 'Data loaded \n' );
end
```

```
Loading exp. data 1 ...
Loading exp. data 4 ...
Loading exp. data 3 ...
Loading exp. data 2 ...
Saved
```

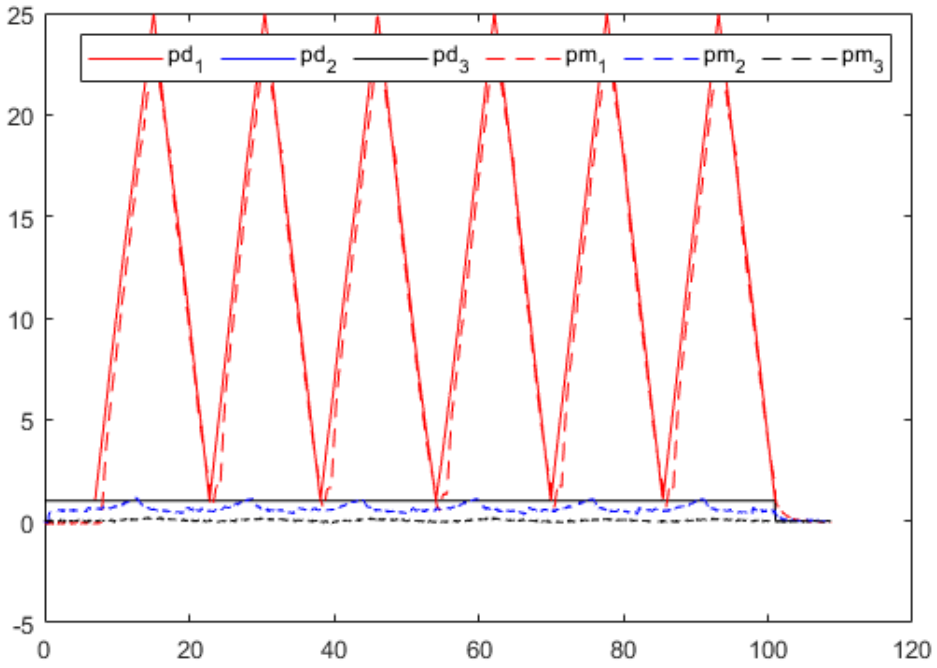
Symbolic EOM

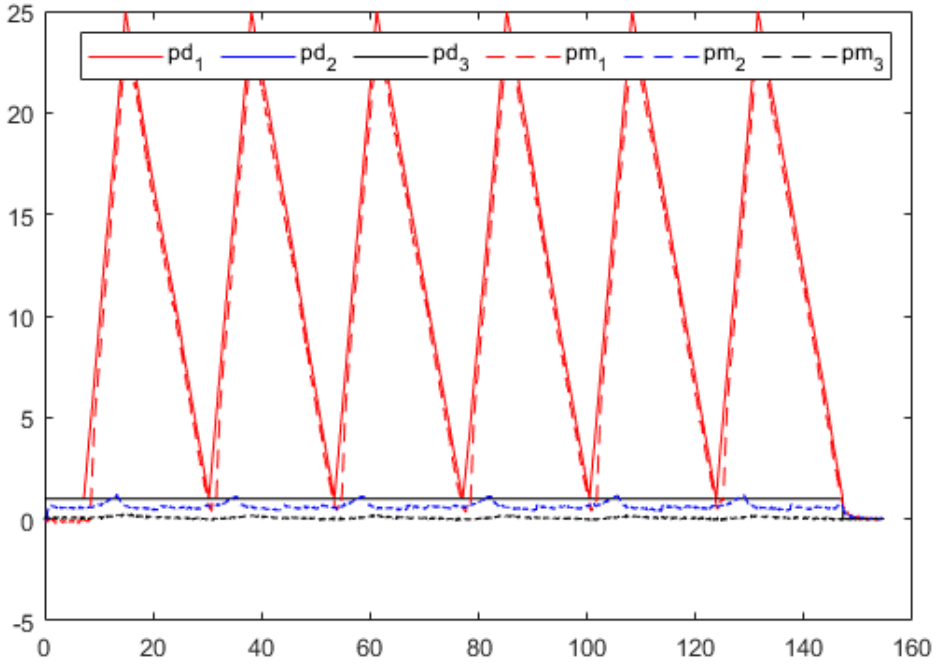
```
if par_set.EOM==1
par_set=func_EOM_baseFrame(par_set);
end
```

system ID sets

par_set.trial_0_25psi=func_sysID(par_set.trial_0_25psi,par_set); par_set.trial_1_25psi=func_sysID(par_set.trial_1_25psi,par_set); par_set.trial_2_25psi=func_sysID(par_set.trial_2_25psi,par_set); par_set.trial_3_25psi=func_sysID(par_set.trial_3_25psi,par_set); par_set.trial_4_25psi=func_sysID(par_set.trial_4_25psi,par_set);

```
func_plot_pressure_3chambers(par_set.trial_25_0psi)
par_set.trial_25_0psi=func_sysID(par_set.trial_25_0psi,par_set);

func_plot_pressure_3chambers(par_set.trial_25_1psi)
par_set.trial_25_1psi=func_sysID(par_set.trial_25_1psi,par_set);

func_plot_pressure_3chambers(par_set.trial_25_2psi)
par_set.trial_25_2psi=func_sysID(par_set.trial_25_2psi,par_set);

func_plot_pressure_3chambers(par_set.trial_25_3psi)
par_set.trial_25_3psi=func_sysID(par_set.trial_25_3psi,par_set);
% par_set.trial_25_4psi=func_sysID(par_set.trial_25_4psi,par_set);

Dividing trainning set and validation set
Estimated [alpha,k,d] is [3.0742,0.1035,0.0456]
Dividing trainning set and validation set
Estimated [alpha,k,d] is [3.4063,0.1022,0.0359]
Dividing trainning set and validation set
Estimated [alpha,k,d] is [5.0331,0.1045,0.0219]
Dividing trainning set and validation set
Estimated [alpha,k,d] is [-0.2304,0.2467,0.0185]
```


pd1
pd2
pd3
pm1
pm2
pm3
25
20
15
10
5
0
-5
0
20
40
60
80
100
120


pd1
pd2
pd3
pm1
pm2
pm3
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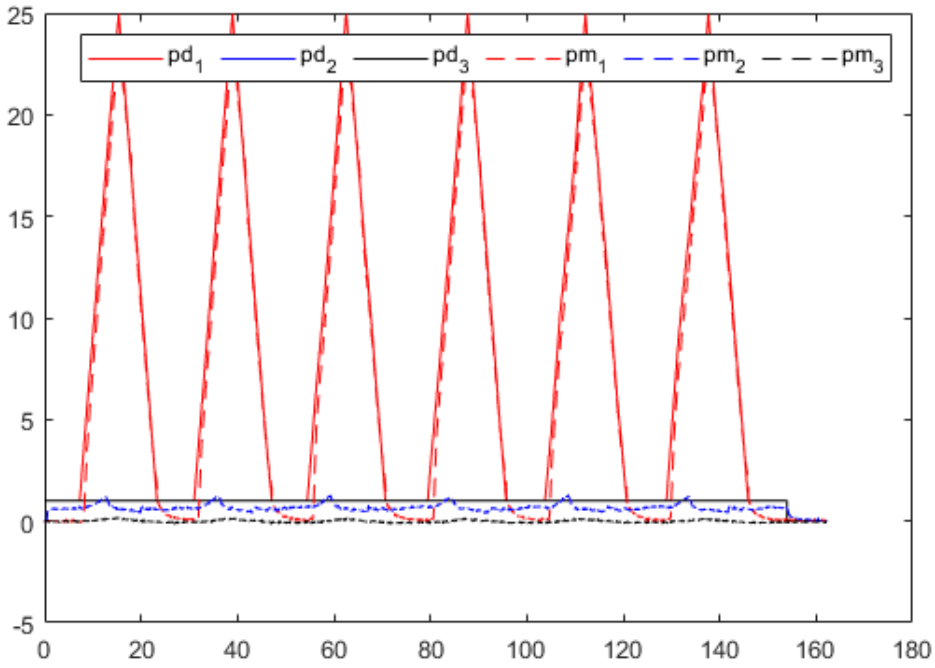
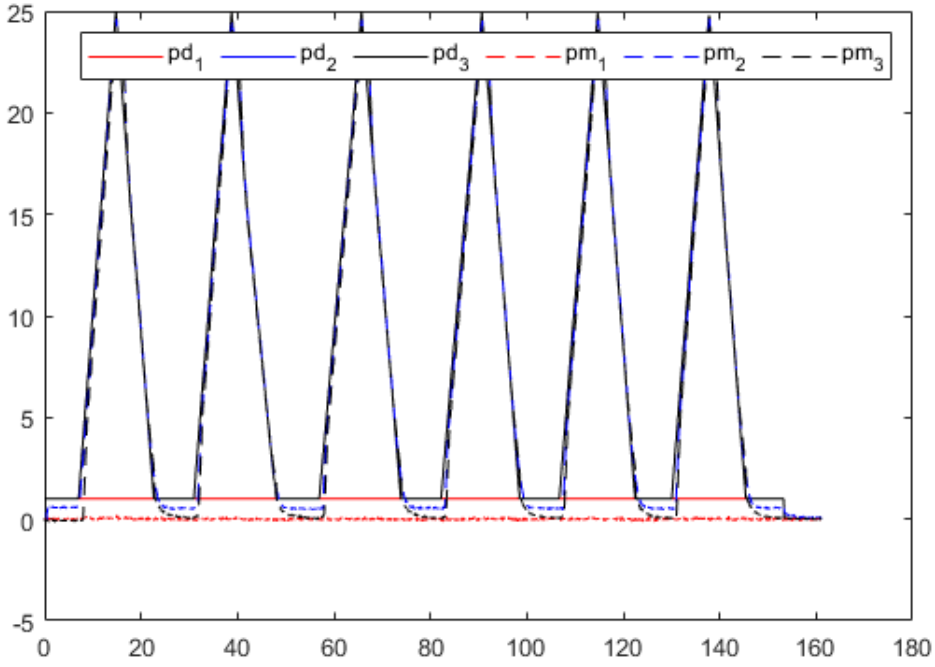
20
15
10
5
0
-5
0
20
40
60
80
100
120
140
160





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