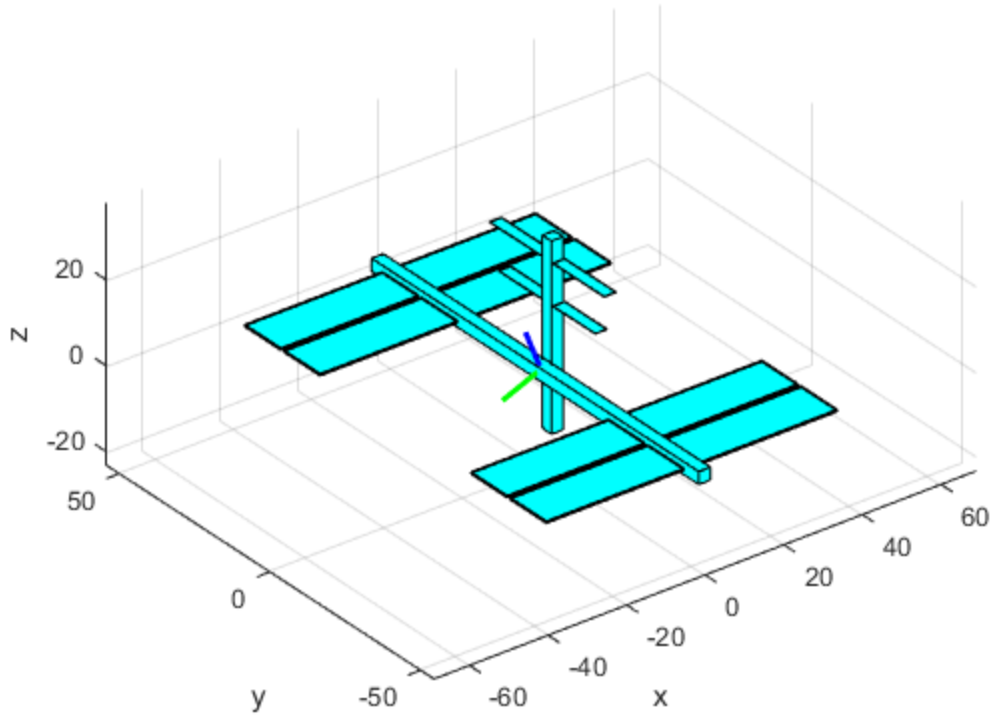
```
%the main wrapper
clear;clc; close all

% ISS length: 72.8m width: 108.5m height: 20m

chd = {};
%main truss
chd{end+1} = mkChild(3,108.5,3,1000,-1.5,-108.5/2,-1.5,0,0,0);
%pressurized area
chd{end+1} = mkChild(3,3,45,1000,1.5,-1.5,-15,0,0,0);
%solar panel
chd{end+1} = mkChild(3, 17, 0.1, 1000, 1.5, 2, 25, 0,0,0);
chd{end+1} = mkChild(3, 17, 0.1, 1000, 1.5, -19, 25, 0,0,0);

chd{end+1} = mkChild(3, 14, 0.1, 1000, 1.5, 2, 15, 0,0,0);
chd{end+1} = mkChild(3, 14, 0.1, 1000, 1.5, -16, 15, 0,0,0);

%top solar panels
chd{end+1} = mkChild(35,12,0.5,1000,2,-50,0,0,0,0);
chd{end+1} = mkChild(35,12,0.5,1000,2,-37,0,0,0,0);
chd{end+1} = mkChild(35,12,0.5,1000,2, 38,0,0,0,0);
chd{end+1} = mkChild(35,12,0.5,1000,2, 25,0,0,0,0);

%bottom solar panels
chd{end+1} = mkChild(35,12,0.5,1000,-37,-50,0,0,0,0);
chd{end+1} = mkChild(35,12,0.5,1000,-37,-37,0,0,0,0);
chd{end+1} = mkChild(35,12,0.5,1000,-37, 38,0,0,0,0);
chd{end+1} = mkChild(35,12,0.5,1000,-37, 25,0,0,0,0);


%generate geometry
S_top = genGeom(chd);



fig1 = figure;hold on;
fig1 = plotSC(fig1, S_top);
fig1 = plotAxesTriads(fig1, S_top, 10);
grid on

% PS1.9: Orbit Propagation

% options = simset('SrcWorkspace','current');
% sim('orbitSIM',[],options);
```

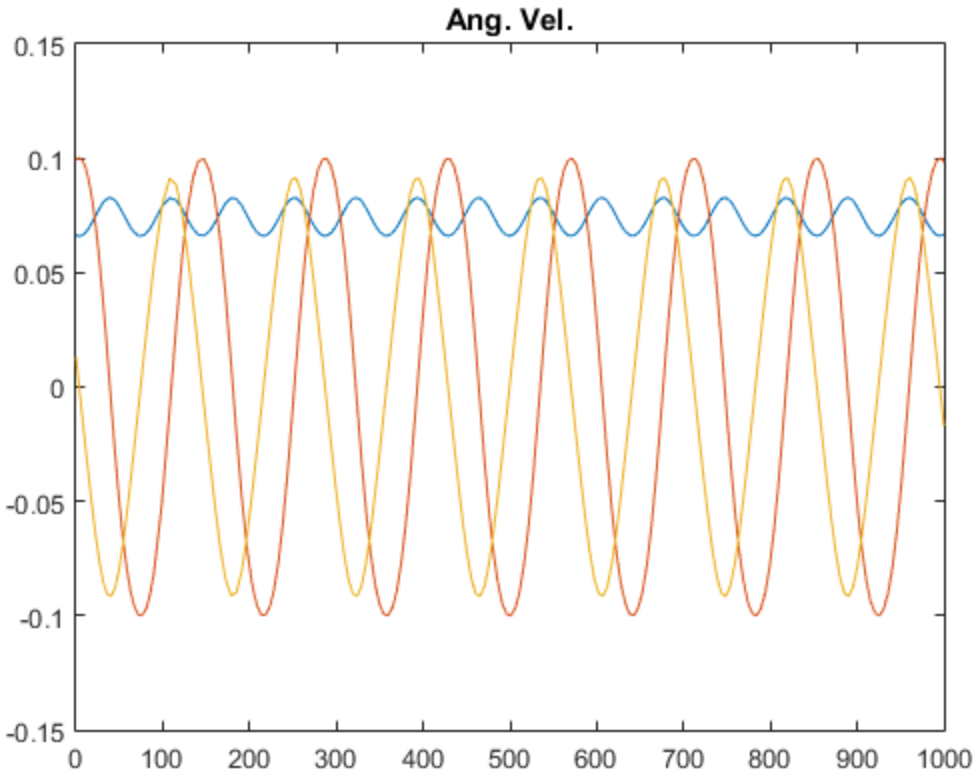


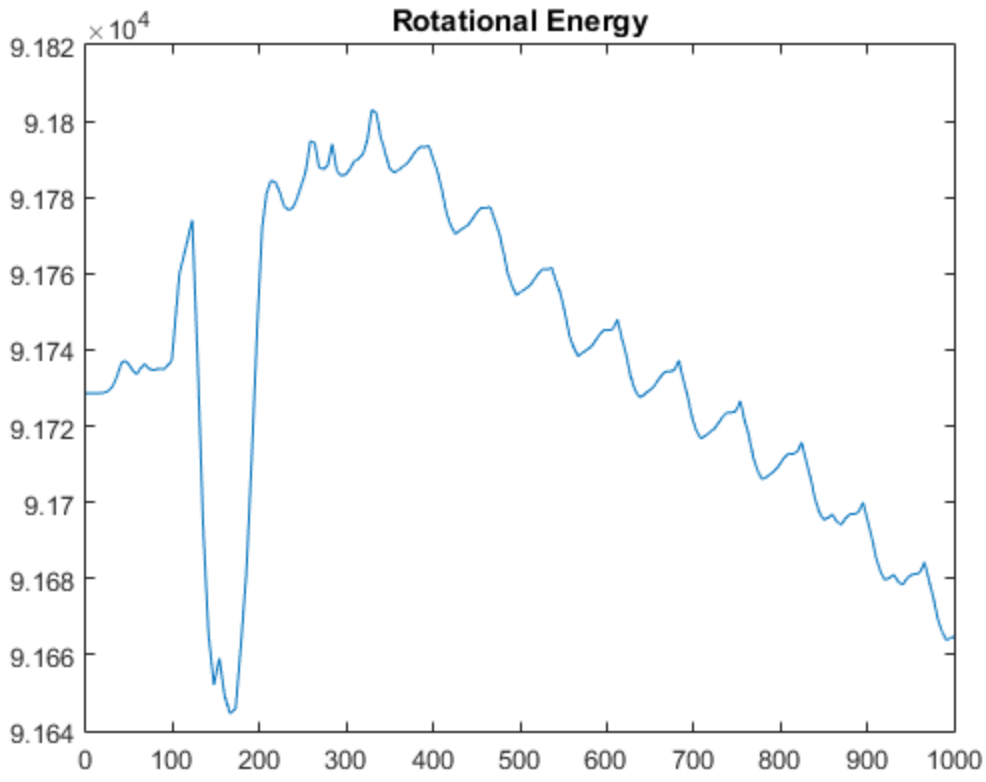
---------- PS2 ----------

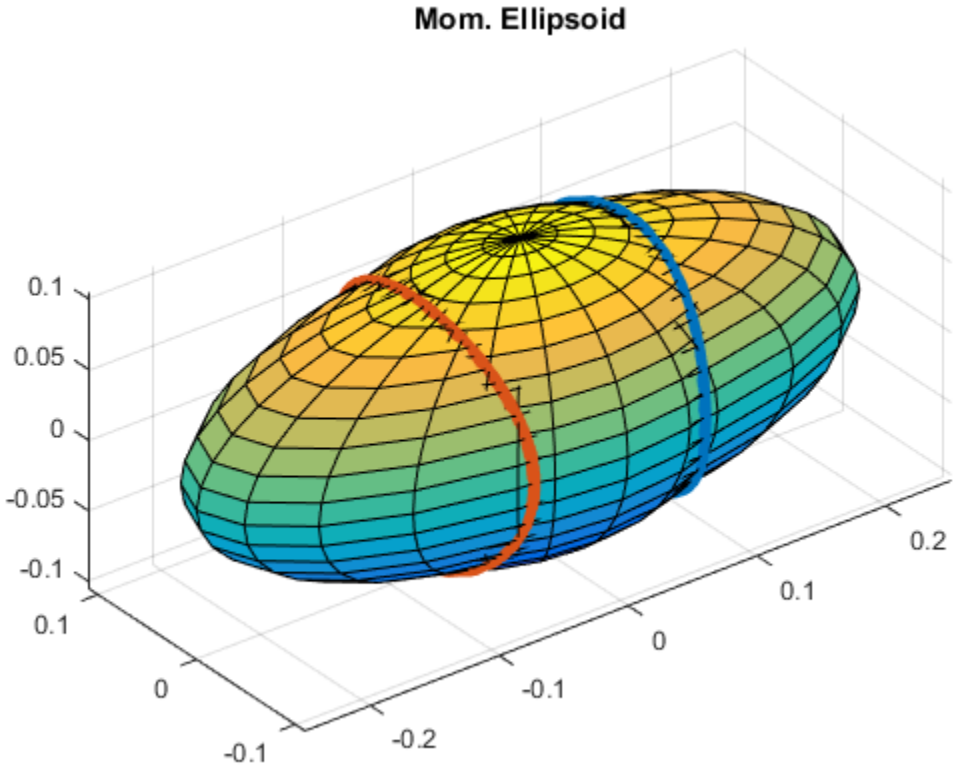
```
close all
I_principle = S_top.tauCM_P; %principle moment of inertia tensor
M0 = [0 0 0]';
w0 = 10/180*pi*rand([3,1]);
w0_28 = w0;
t_total = 1000;
options = simset('SrcWorkspace','current');
sim('eulerSIM',[],options);

% PS 2.1-2.6
PS2_SCRIPT
% PS 2.7
w0 = [0; 0; 10/180*pi*rand()]; % ang vel parallel to principle axes
sim('eulerSIM',[],options);
%plotting
PS2_SCRIPT
% PS 2.8
t_total = 100;
w0 = w0_28;
I_principle(2,2) = I_principle(1,1); %axi-symmetric
sim('eulerSIM',[],options);
% PS 2.9
y = eulerAnalytic( w0, I_principle, tout );
ang_vel_analytic = [y, repmat(w0(3), [size(y,1), 1])];
```

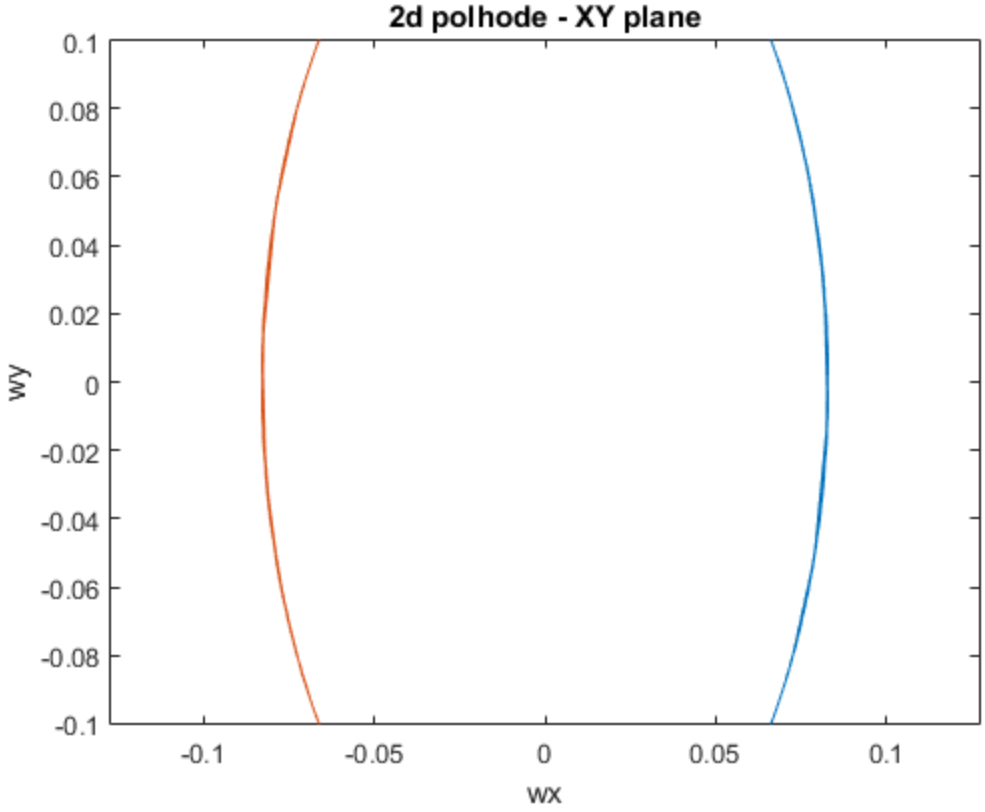
```
% figure; plot(tout, ang_vel); title('Ang. Vel.')
% figure; plot(tout, ang_vel_analytic); legend('Numerical','Analytic')
ang_vel_diff = ang_vel - ang_vel_analytic;
figure; plot(tout, ang_vel_diff); title('Difference in Ang. Vel.,
 Numeric vs Analytic')
xlabel('time (s)'); ylabel('w_{diff} (rad/s)')
max_diff = max(max(ang_vel_diff));
fprintf('Maximum ang. vel. difference: %.3E deg/s\n', max_diff/pi*180)
```

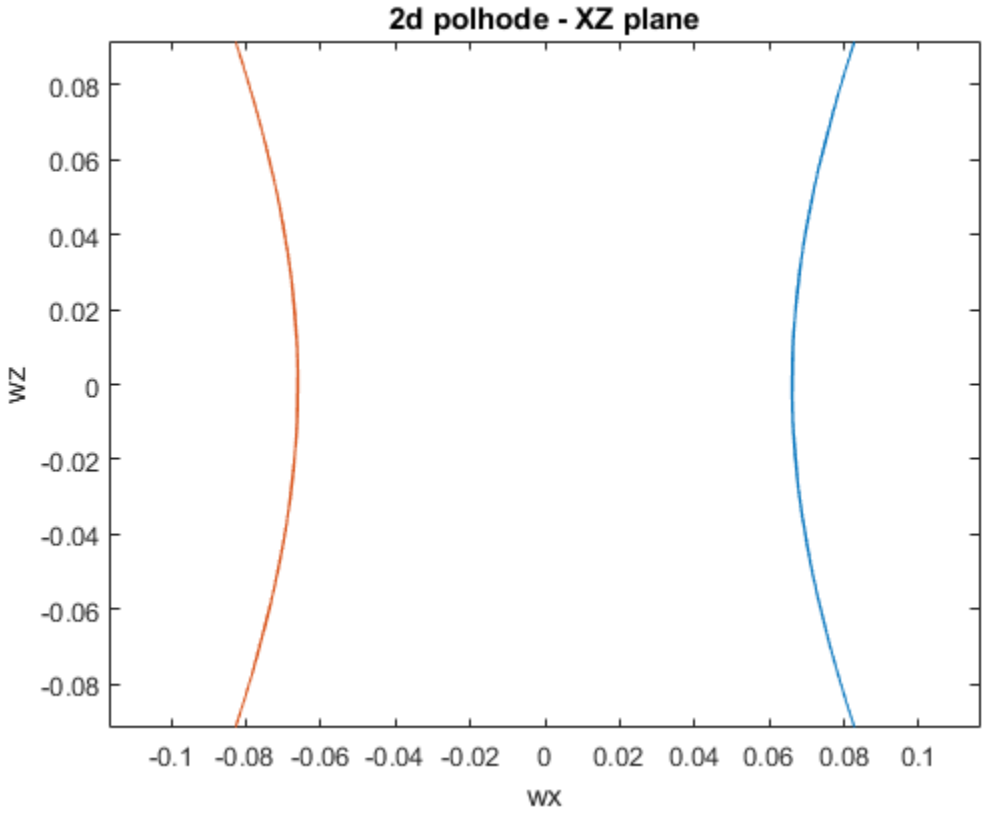
Maximum ang. vel. difference: 4.560E-05 deg/s

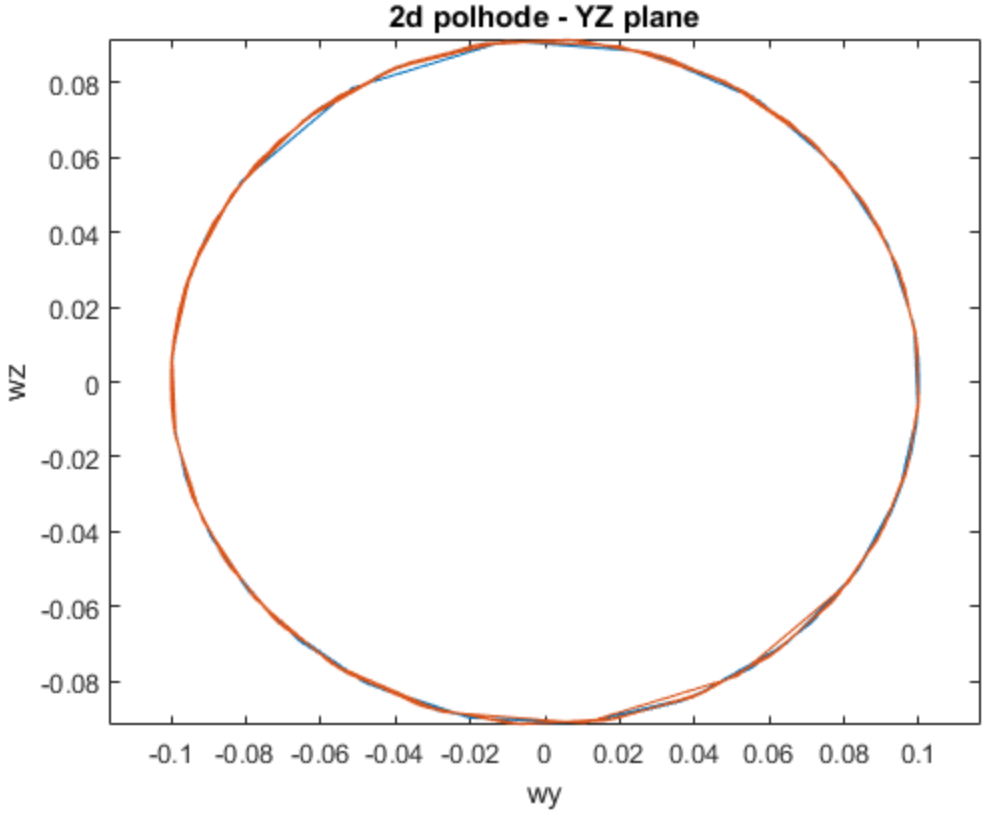


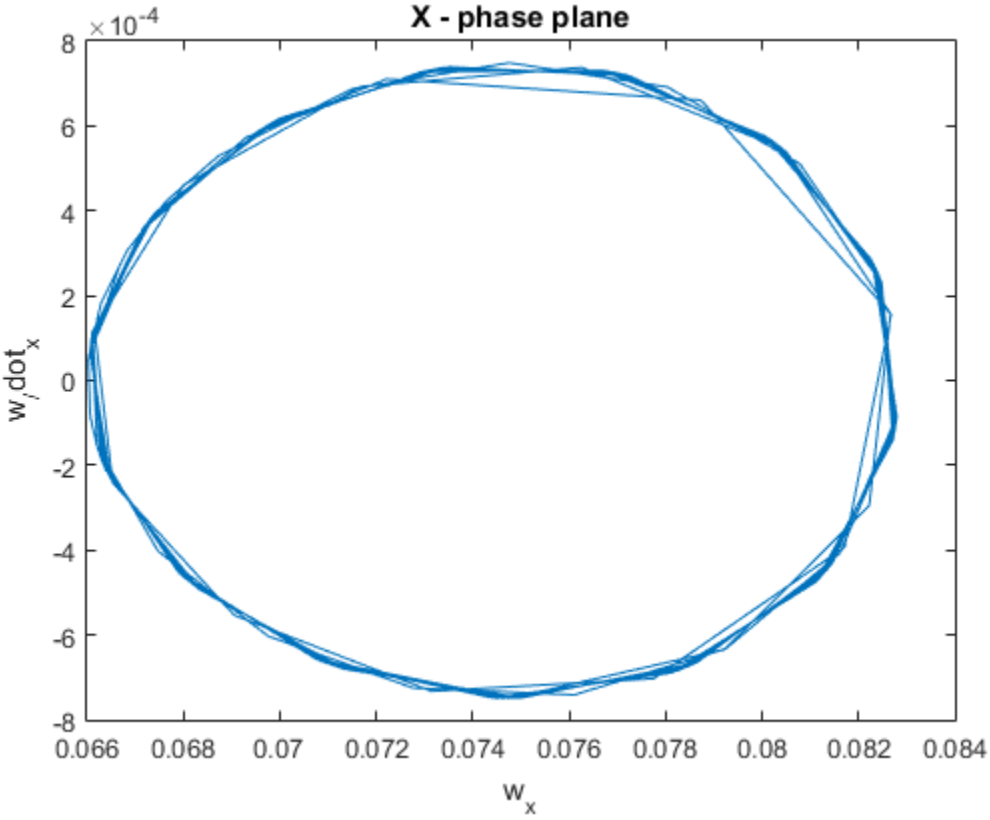

Rotational Energy
×10^4
9.182
9.18
9.178
9.176
9.174
9.172
9.17
9.168
9.166
9.164
0
100
200
300
400
500
600
700
800
900
1000

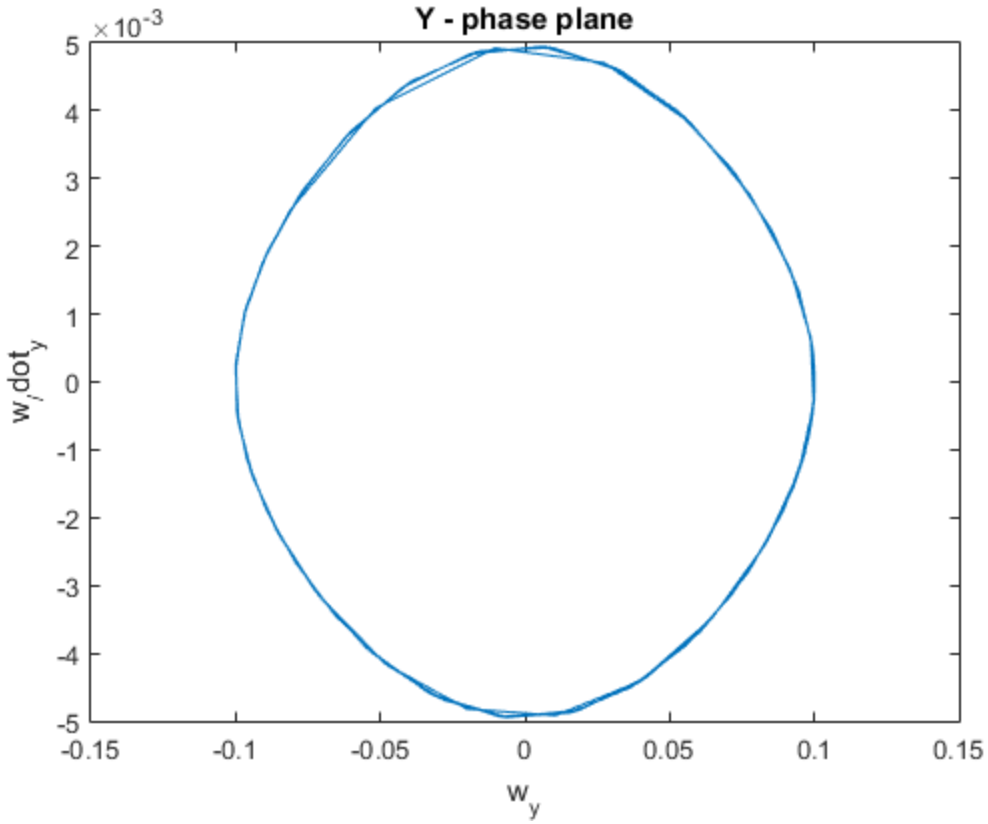

Mom. Ellipsoid
0.1
0.05
0
-0.05
-0.1
0.1
0
-0.1
-0.2
-0.1
0
0.1
0.2

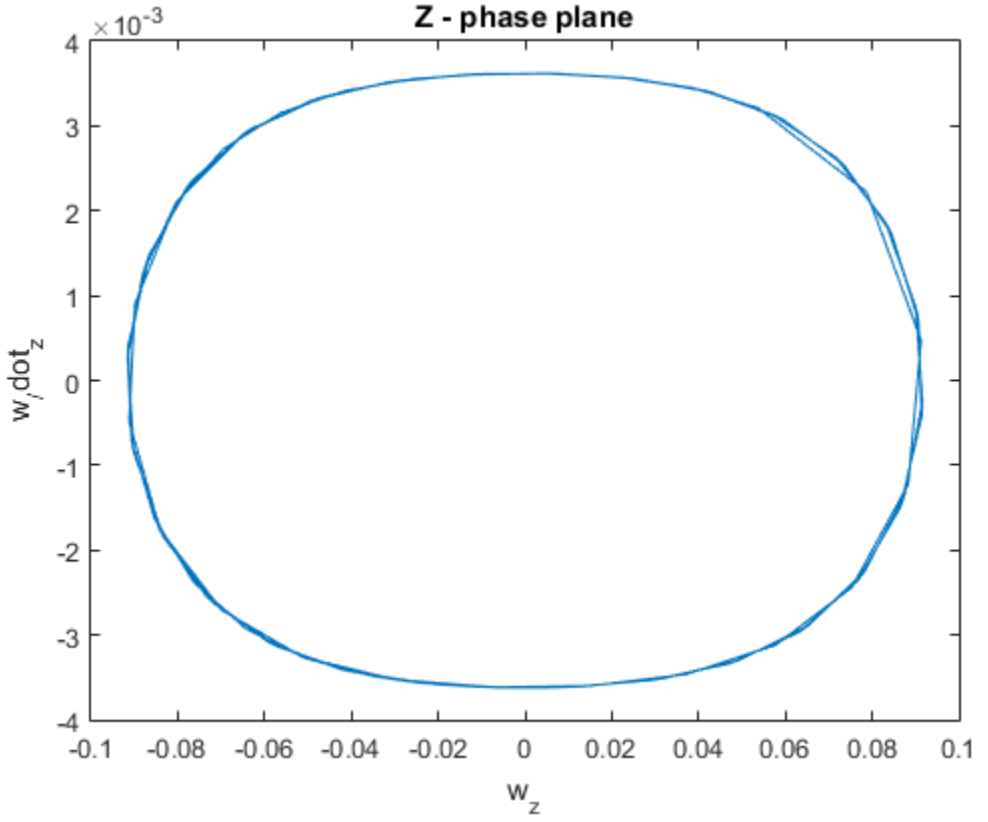

2d polhode - XY plane
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
wy
-0.1
-0.05
0
0.05
0.1
wx

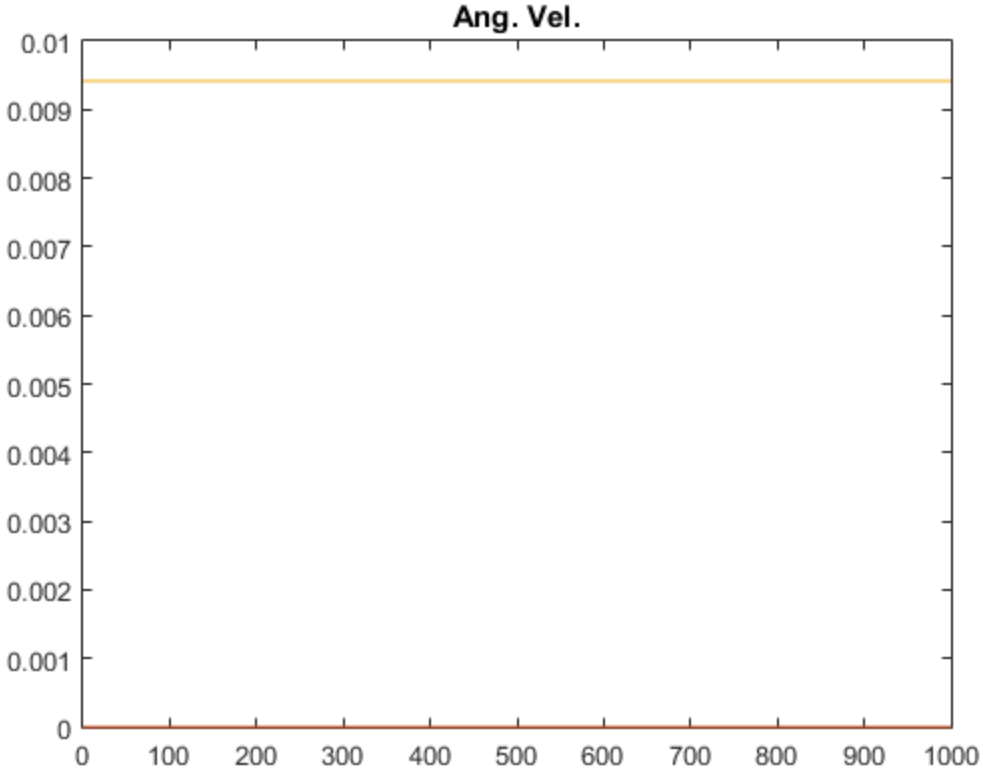

2d polhode - XZ plane
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
wz
-0.1
-0.08
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
0.08
0.1
wx

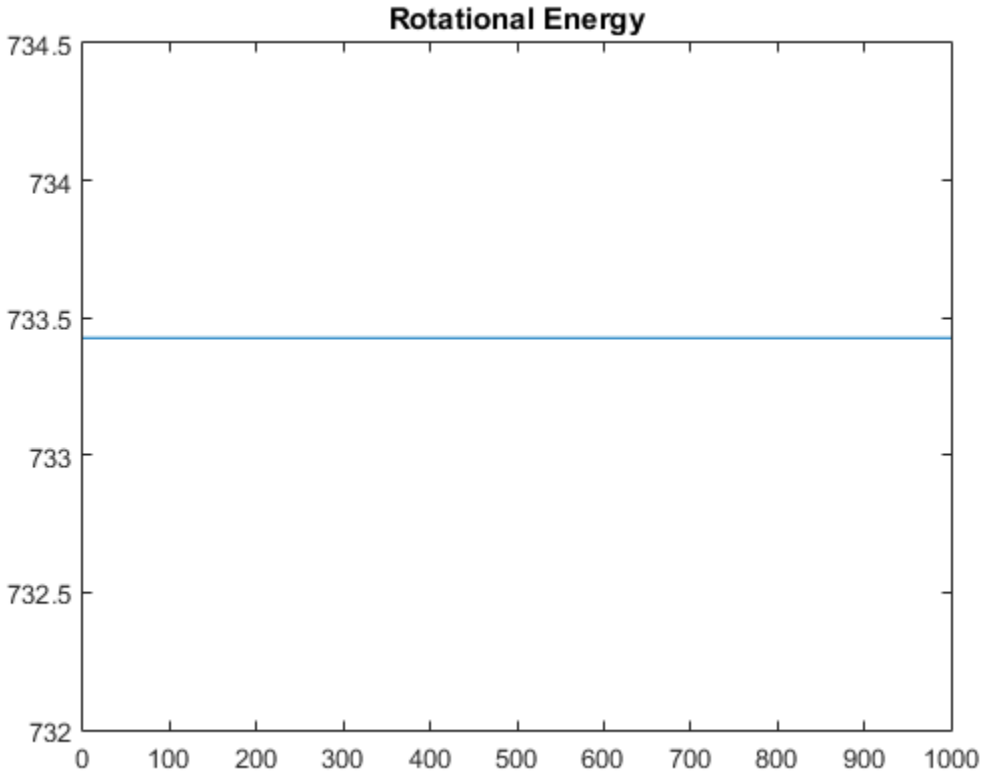

2d polhode - YZ plane
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
wz
-0.1 -0.08 -0.06 -0.04 -0.02 0 0.02 0.04 0.06 0.08 0.1
wy

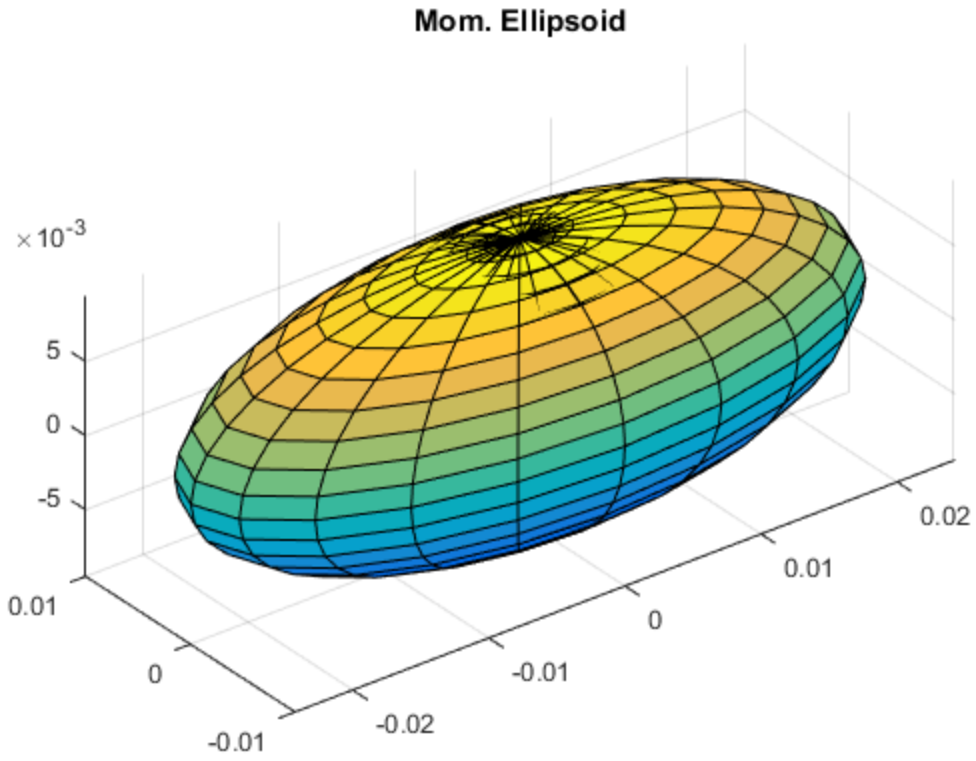

X - phase plane
×10^-4
8
6
4
2
0
-2
-4
-6
-8
w_i dot_x
0.066 0.068 0.07 0.072 0.074 0.076 0.078 0.08 0.082 0.084
w_x

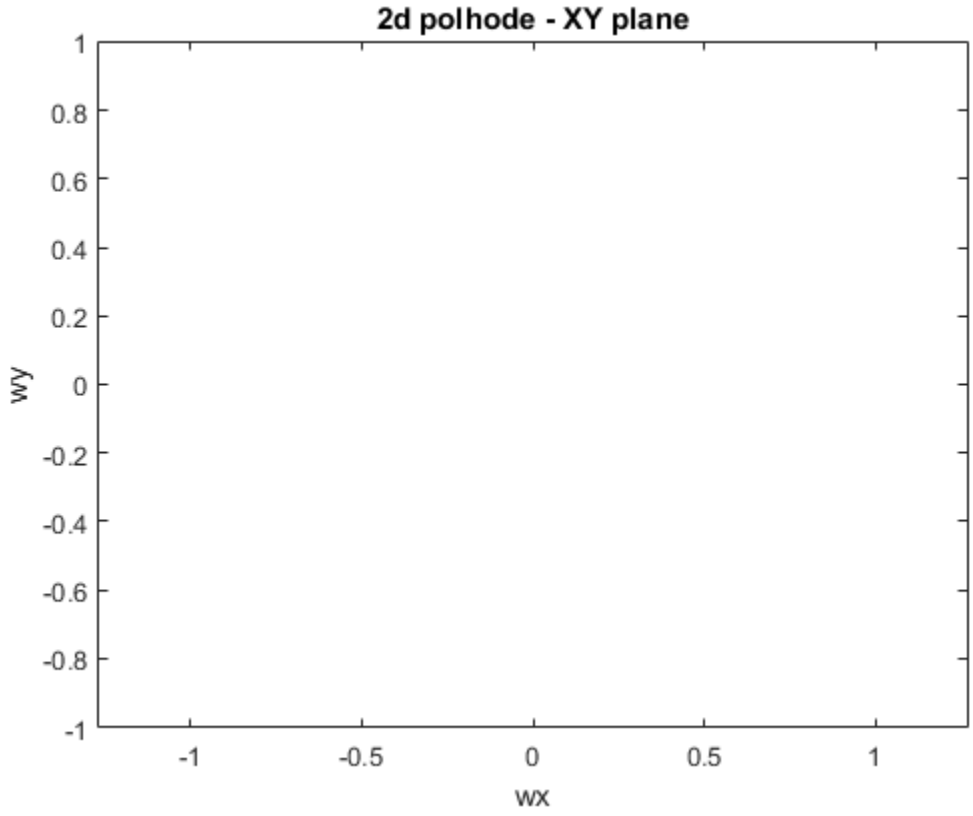

Y - phase plane
×10^-3
5
4
3
2
1
0
-1
-2
-3
-4
-5
-0.15
-0.1
-0.05
0
0.05
0.1
0.15
w_y
w_y dot

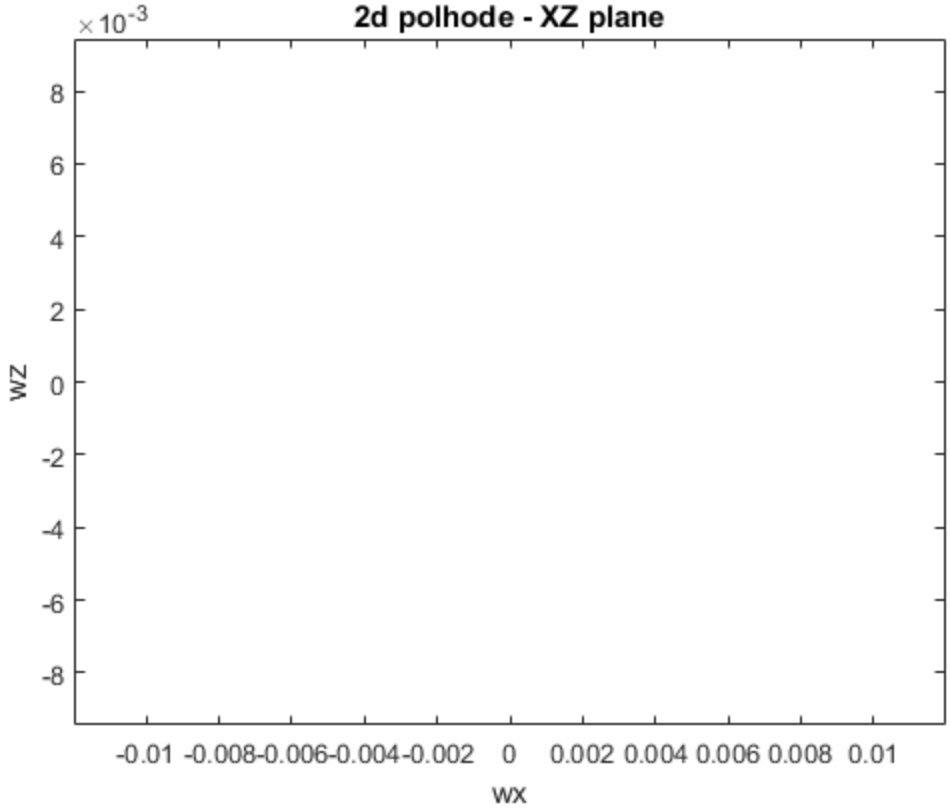

Z - phase plane
×10^-3
4
3
2
1
0
-1
-2
-3
-4
-0.1
-0.08
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
0.08
0.1
w_z
w_z dot

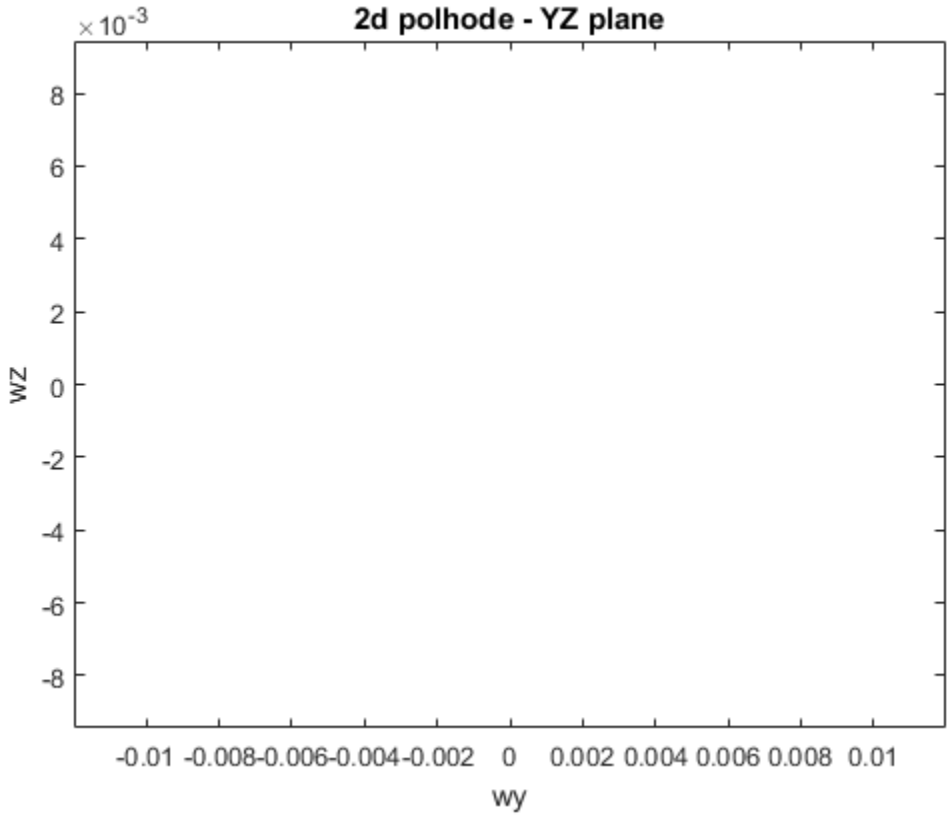

Ang. Vel.
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
0
100
200
300
400
500
600
700
800
900
1000

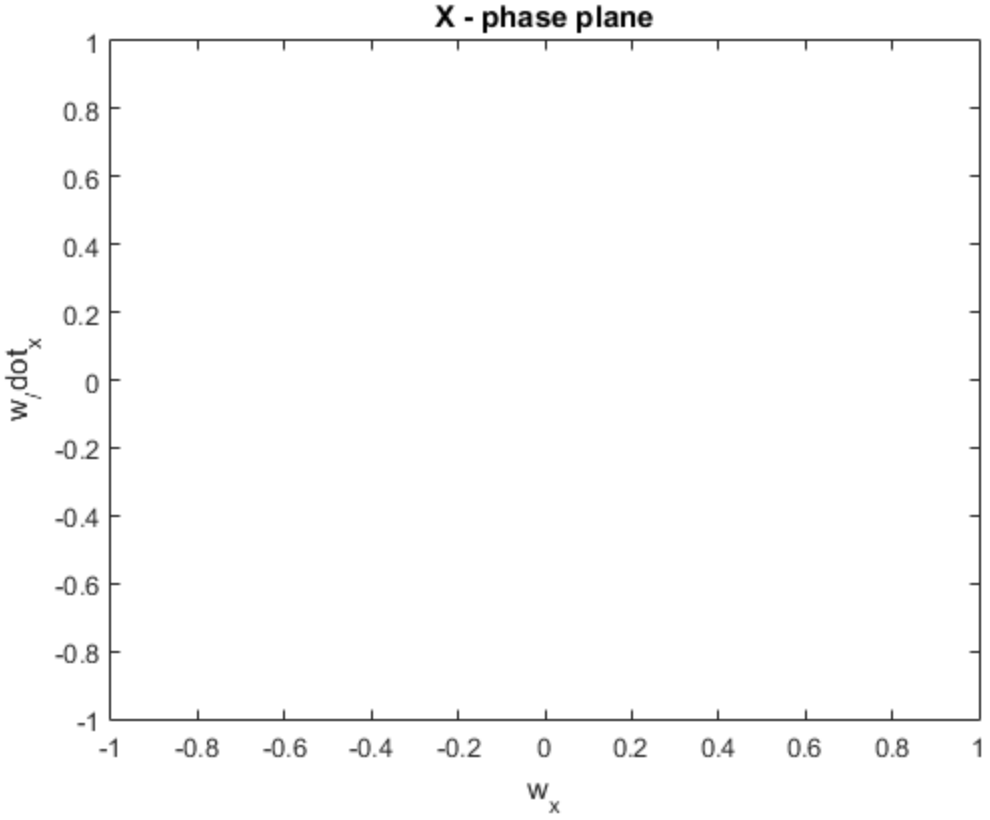

Rotational Energy
734.5
734
733.5
733
732.5
732
0
100
200
300
400
500
600
700
800
900
1000

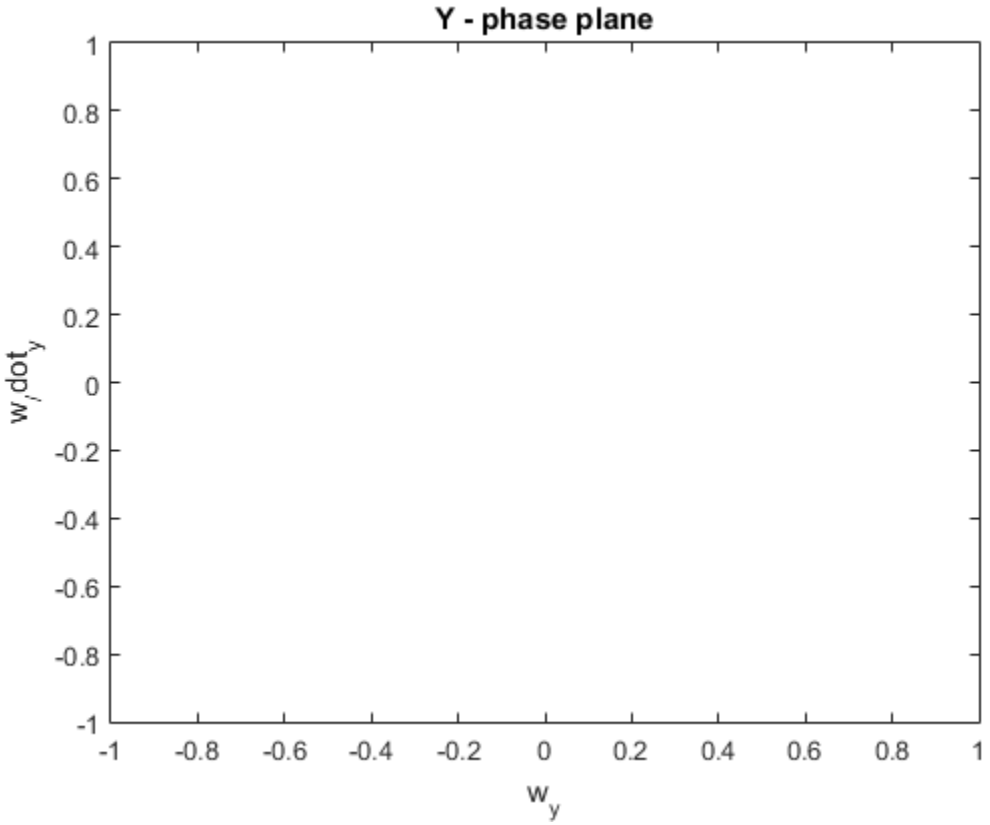

Mom. Ellipsoid
×10-3
5
0
-5
0.01
0
-0.01
-0.02
-0.01
0
0.01
0.02

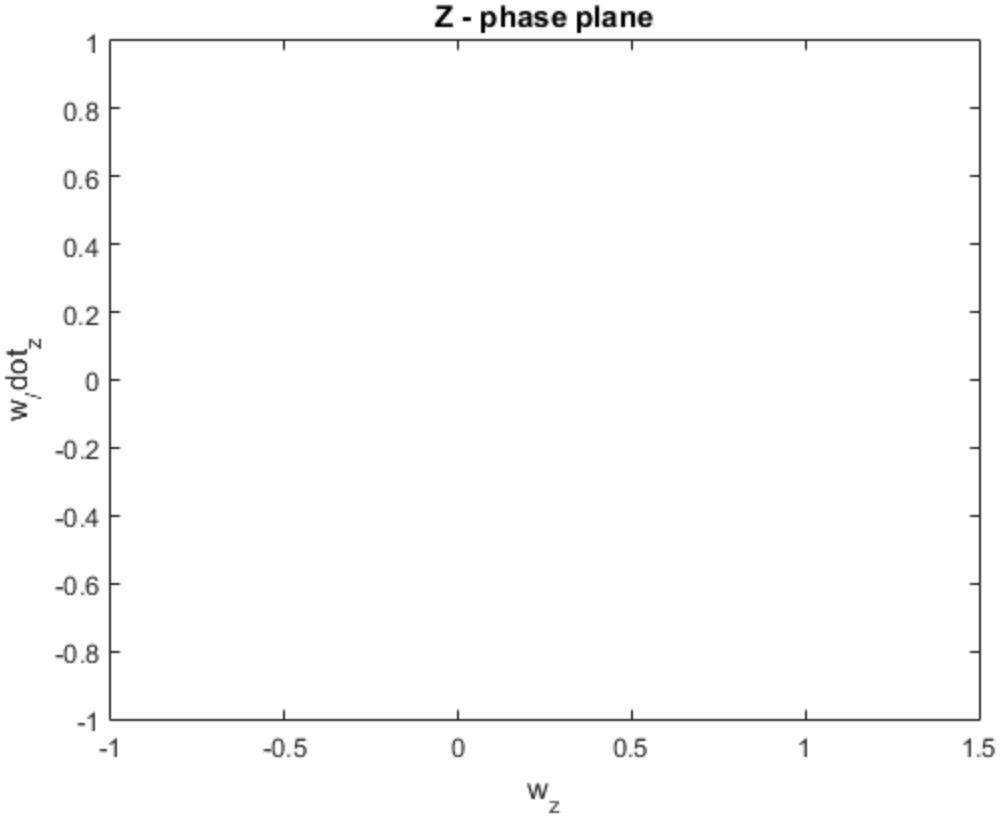

2d polhode - XY plane
wy
wx
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1
-0.5
0
0.5
1

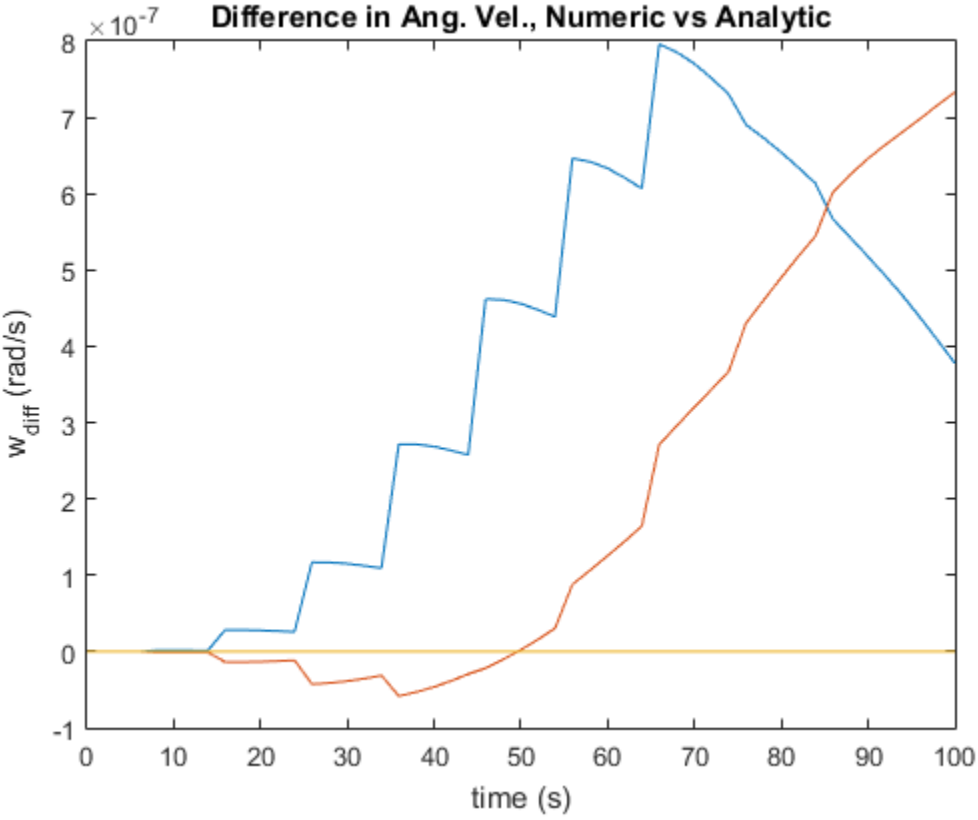

2d polhode - XZ plane
×10^-3
8
6
4
2
0
-2
-4
-6
-8
wz
-0.01 -0.008 -0.006 -0.004 -0.002 0 0.002 0.004 0.006 0.008 0.01
wx


2d polhode - YZ plane
×10^-3
8
6
4
2
0
-2
-4
-6
-8
wz
-0.01 -0.008 -0.006 -0.004 -0.002 0 0.002 0.004 0.006 0.008 0.01
wy


X - phase plane
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
w_x
w_i dot_x


Y - phase plane
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
w_y
w_i dot_y


Z - phase plane
w_i dot_z
w_z
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1
-0.5
0
0.5
1
1.5


Difference in Ang. Vel., Numeric vs Analytic
×10^-7
w_diff (rad/s)
time (s)
8
7
6
5
4
3
2
1
0
-1
0
10
20
30
40
50
60
70
80
90
100

---------- PS3 ----------

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