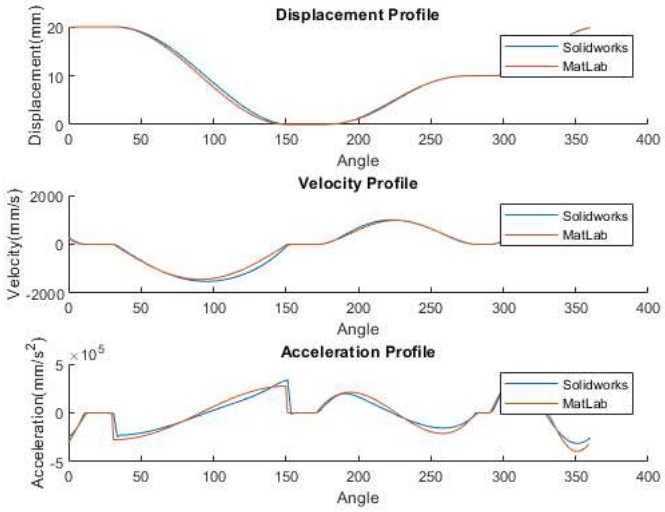
```
clear all;
close all;
clc;
format long;

name = 'Natalie Ratzlaff';
id = 'A17091327';
hw_num = 4;

ta = 0:109;
tb = 110:119;
tc = 120:199;
td = 200:219;
te = 220:339;
tf = 340:359;
w = (1000)*2*pi/60;
ya = 100.*(ta./110).^3 - 150.*(ta./110).^4 + 60.*(ta./110).^5;
dya = (300.*(ta./110).^2 - 600.*(ta./110).^3 + 300.*(ta./110).^4)*w;
d2ya = (600.*(ta./110) - 1800.*(ta./110).^2 + 1200.*(ta./110).^3)*w^2;
yb = 10 + 0.*tb;
dyb = 0.*tb;
d2yb = 0.*tb;
yc = 10 + 10.*((tc-120)./80 - 1/(2*pi)*sin(2*pi.*(tc-120)./80));
dyc = (10*(w/80).*(1-cos(2*pi.*(tc-120)./80)))*w;
d2yc = (20*pi*(w/80)^2.*sin(2*pi.*(tc-120)./80))*w^2;
yd = 20 + 0.*td;
dyd = 0.*td;
d2yd = 0.*td;
ye = -10.*(1-cos(pi.*(te-220)./120)) + 20;
dye = (-10*(pi*w/120).*sin(pi.*(te-220)./120))*w;
d2ye = (-10*(pi*w/120)^2.*cos(pi.*(te-220)./120))*w^2;
yf = 0.*tf;
dyf = 0.*tf;
d2yf = 0.*tf;

t = [ta tb tc td te tf];
y = [yc(70:80) yd ye yf ya yb yc(1:69)];
dy= [dyc(70:80) dyd dye dyf dya dyb dyc(1:69)]./2;
d2y = [d2yc(70:80) d2yd d2ye d2yf d2ya d2yb d2yc(1:69)]./3;

disp = readmatrix("follower_disp.csv");
vel = readmatrix("follower_vel.csv");
acc = readmatrix("follower_acc.csv");
figure(1);
subplot(3,1,1);
hold on;
plot(disp(:,1).*360./0.06,disp(:,2)-26);
plot(t,y);
title('Displacement Profile');
xlabel('Angle');
ylabel('Displacement(mm)');
legend('Solidworks','MatLab');
subplot(3,1,2);
hold on;
plot(vel(:,1).*360./0.06,vel(:,2));
plot(t,dy);
title('Velocity Profile');
xlabel('Angle');
ylabel('Velocity(mm/s)');
legend('Solidworks','MatLab');
subplot(3,1,3);
hold on;
plot(acc(:,1).*360./0.06,acc(:,2));
plot(t,d2y);
title('Acceleration Profile');
xlabel('Angle');
ylabel('Acceleration(mm/s^2)');
legend('Solidworks','MatLab');

p1a = 'See figure 1'
p1b = 'Solidworks and MatLab plots are very similar, and discrepancies likely originate from the 2 degree resolution used for Solidworks, as compared to the 1 degre

p2a = [60 -60 0;-60 180 -120;0 -120 120]
K = [180 -120; -120 120];
p2b = inv(K)*[10;-20]
p2c = [10; 10; -20]


a = 45;
T = [cos(a) -sin(a) 0 0; sin(a) cos(a) 0 0; 0 0 cos(a) -sin(a); 0 0 sin(a) cos(a)];
Ke = [1 0 -1 0; 0 0 0 0; -1 0 1 0; 0 0 0 0];

E = 210000000000;
P = 64000;
A = pi()*0.025^2;
```

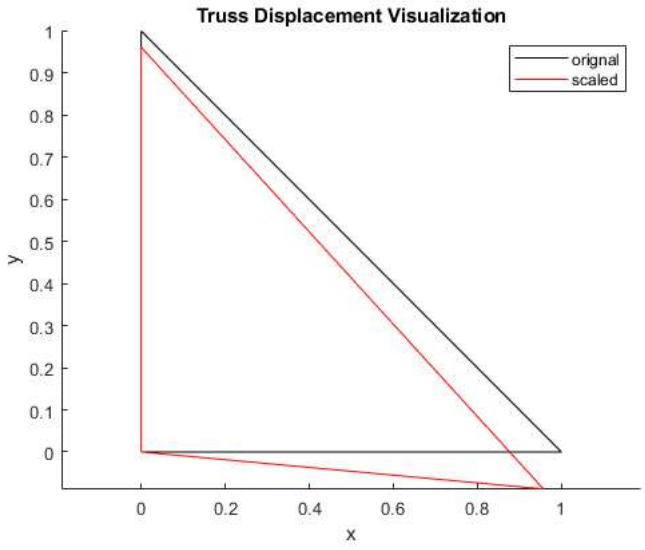
```
p4a = (E/sqrt(2))*T*Ke*inv(T)
p4b = E*[0 0 0 0; 0 1 0 -1; 0 0 0 0; 0 -1 0 1]
p4c = E*Ke

m12 = zeros(6,6);
m12(1:4,1:4) = p4a;
m23 = zeros(6,6);
m23(3:6,3:6) = p4b;
m31 = E*[1 0 0 0 -1 0; 0 0 0 0 0 0; 0 0 0 0 0 0; 0 0 0 0 0 0; -1 0 0 0 1 0; 0 0 0 0 0 0];

p4d = m12 + m23 + m31

m = [p4d(1,1) p4d(1,2) p4d(1,4); p4d(2,1) p4d(2,2) p4d(2,4); p4d(4,1) p4d(4,2) p4d(4,4)];

u = P/(2*A).*inv(m)*[sqrt(3);1;0];
p4e = u(1:2)
p4f = [0;u(3)]
p4g = [0;0]

F = (1/A).*p4d*[u(1); u(2); 0; u(3); 0; 0];
p4h = F(1:2)
p4i = F(3:4)
p4j = F(5:6)

figure(2)
hold on;
plot([0;1],[0;0],'k');
plot([0;0],[0;1],'k');
plot([0,1],[1,0],'k');
plot([0;1-500*u(1)],[0;-500*u(2)],'r');
plot([0;0],[0;1-500*u(3)],'r');
plot([0,1-500*u(1)],[1-500*u(3),-500*u(2)],'r');
legend('orignal','','','scaled');
title('Truss Displacement Visualization');
xlabel('x');
ylabel('y');
axis equal;

p4k = 'See figure 2'
```

```
p1a =

    'See figure 1'


p1b =

    'Solidworks and MatLab plots are very similar, and discrepancies likely originate from the 2 degree resolution used for Solidworks, as compared to the 1 degree


p2a =

    60   -60     0
   -60   180  -120
     0  -120   120


p2b =

  -0.166666666666667
  -0.333333333333333


p2c =

    10
    10
   -20


p4a =

   1.0e+11 *

  Columns 1 through 3

   0.409784433188375   0.663758658349608  -0.409784433188375
   0.663758658349608   1.075139807303374  -0.663758658349608
  -0.409784433188375  -0.663758658349608   0.409784433188375
  -0.663758658349608  -1.075139807303374   0.663758658349608

  Column 4

  -0.663758658349608
  -1.075139807303374
```

```
   0.663758658349608
   1.075139807303374


p4b =

   1.0e+11 *

  Columns 1 through 3

                  0                   0                   0
                  0   2.100000000000000                   0
                  0                   0                   0
                  0  -2.100000000000000                   0

  Column 4

                  0
  -2.100000000000000
                  0
   2.100000000000000


p4c =

   1.0e+11 *

  Columns 1 through 3

   2.100000000000000                   0  -2.100000000000000
                  0                   0                   0
  -2.100000000000000                   0   2.100000000000000
                  0                   0                   0

  Column 4

                  0
                  0
                  0
                  0


p4d =

   1.0e+11 *

  Columns 1 through 3

   2.509784433188375   0.663758658349608  -0.409784433188375
   0.663758658349608   1.075139807303374  -0.663758658349608
  -0.409784433188375  -0.663758658349608   0.409784433188375
  -0.663758658349608  -1.075139807303374   0.663758658349608
  -2.100000000000000                   0                   0
                  0                   0                   0

  Columns 4 through 6

  -0.663758658349608  -2.100000000000000                   0
  -1.075139807303374                   0                   0
   0.663758658349608                   0                   0
   3.175139807303375                   0  -2.100000000000000
                  0   2.100000000000000                   0
  -2.100000000000000                   0   2.100000000000000


p4e =

   1.0e-03 *

   0.086507042314220
   0.175784784014370


p4f =

   1.0e-04 *

                  0
   0.776069817743337


p4g =

     0
     0
```

```
p4h =

   1.0e+10 *

   1.437642243699062
   0.830023136398031


p4i =

   1.0e+09 *

  -5.124310714496986
   0.000000000000002


p4j =

   1.0e+09 *

  -9.252111722493629
  -8.300231363980307


p4k =

    'See figure 2'
```





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camfollwer_hw4 *

Search Commands

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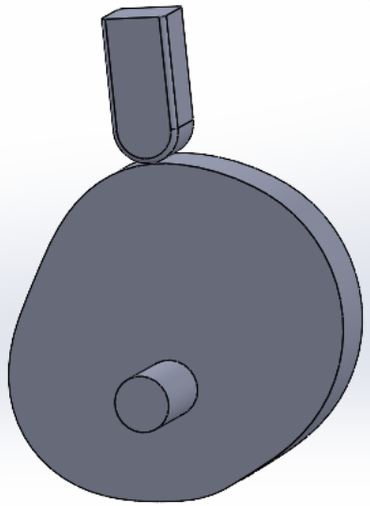
Assembly | Layout | Sketch | Markup | Evaluate | SOLIDWORKS Add-Ins | Simulation | MBD | SOLIDWORKS CAM

- camfollwer_hw4 (Defa
  - History
  - Sensors
  - Annotations
  - Front Plane
  - Top Plane
  - Right Plane
  - Origin
  - Axis1
  - Axis2
  - (-) follower_hw4<
  - (-) Cam<3> (Defa
  - Mates
    - Coincident16 (foll



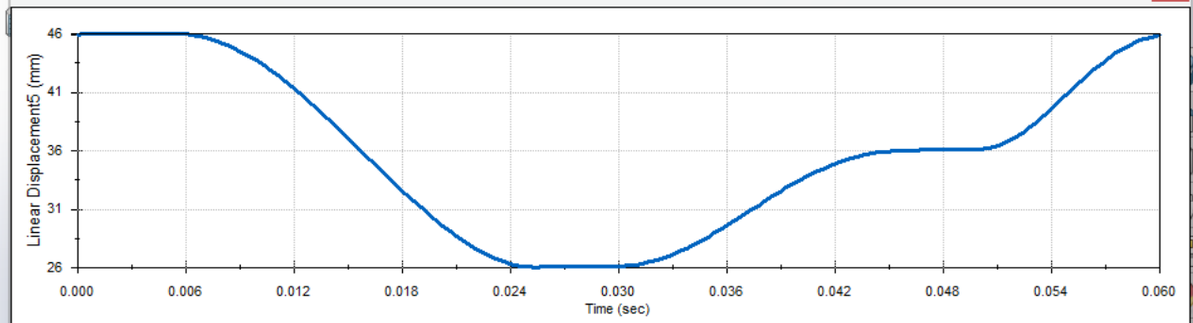
Motion Analysis | 0.1x

0 sec | 0.200 sec | 0.400 sec

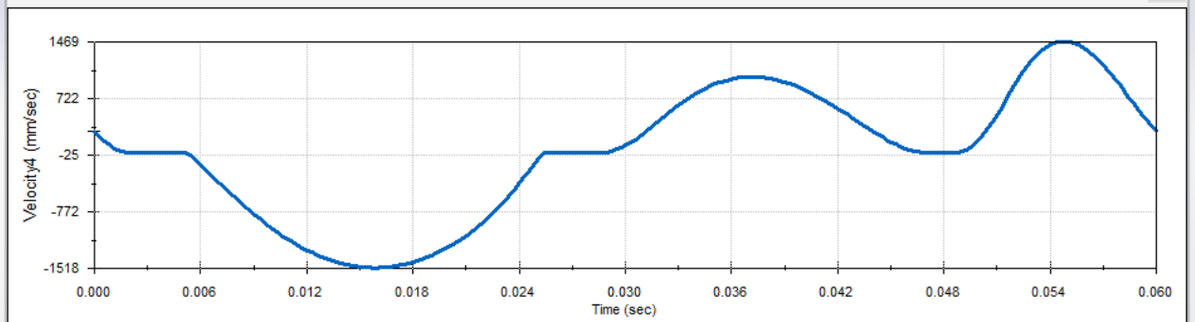
- camfollwer_hw4
  - Orientation
  - Lights, Came
  - RotaryMoto
  - (-) follower_l

Model | 3D Views | Motion Study 2

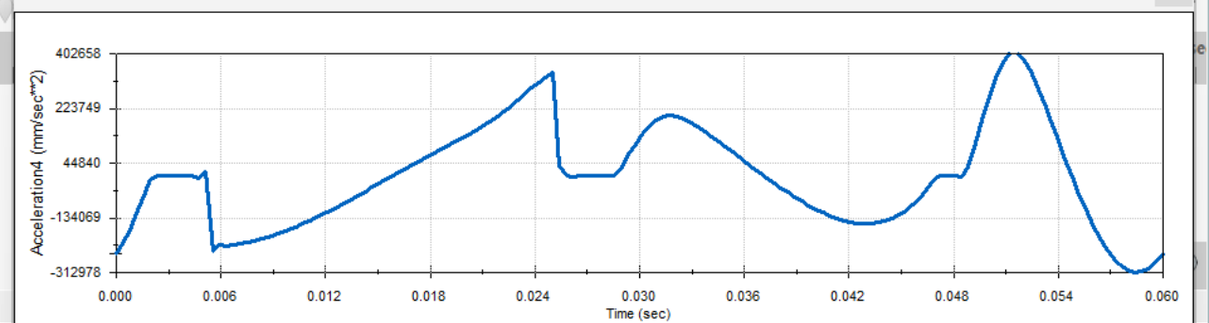
Plot11



Plot12



Plot13



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Radius: 6mm Under Defined Editing Assembly MMGS

7:56 PM 5/13/2024

$$\begin{bmatrix} F_1 \\ F_2 \\ F_3 \\ F_4 \\ F \end{bmatrix} = \begin{bmatrix} k_1+k_2+k_3 & -k_3 & -k_1-k_2 & 0 & 0 \\ -k_3 & k_3+k_5+k_6 & 0 & -k_5-k_6 & 0 \\ -k_1-k_2 & 0 & k_1+k_2+k_4 & -k_4 & 0 \\ 0 & -k_5-k_6 & -k_4 & k_4+k_5+k_6+k_7+k_8 & -k_7-k_8 \\ 0 & 0 & 0 & -k_7-k_8 & k_7+k_8 \end{bmatrix} \begin{bmatrix} 0 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \end{bmatrix}$$