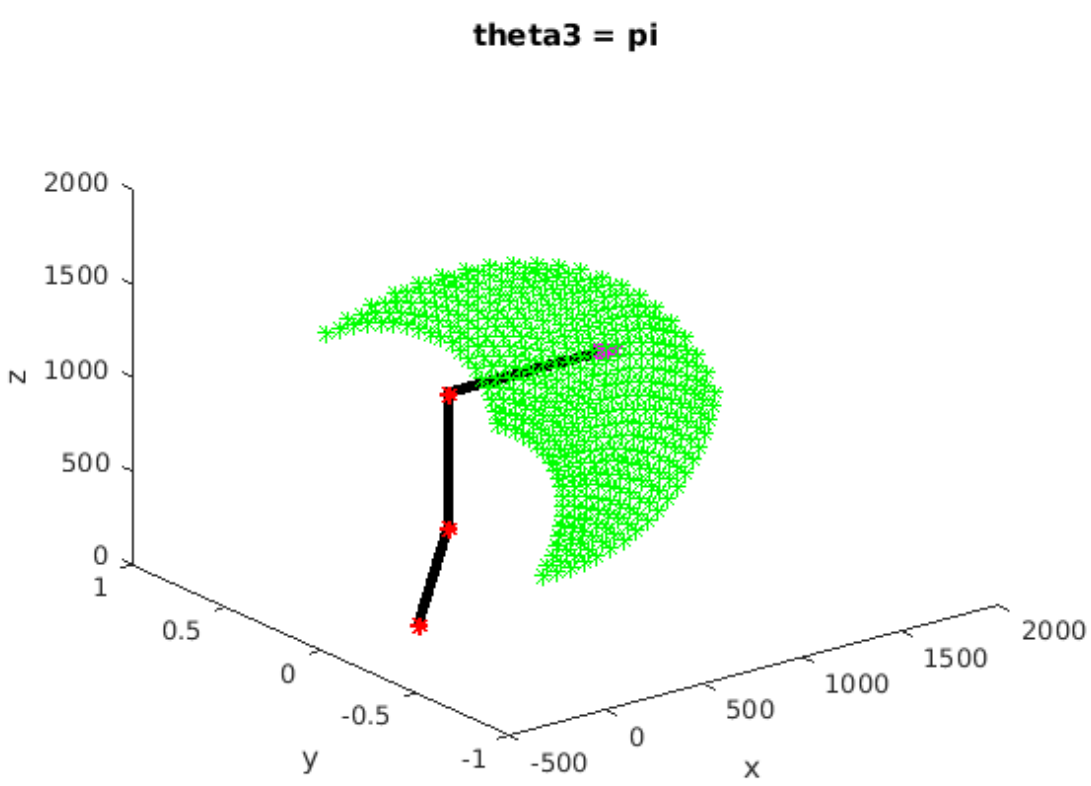
```
%Part A
clear all;
close all;
clc;
links = zeros(3,4);
A = ones(4,4,length(links(:,1)));
T = ones(4,4,length(links(:,1)));

%go to home
theta = [ 0 90  -90 0 0 0  ];
links(1,:) = [ 150 degtorad(90) 475 degtorad(theta(1))];
links(2,:) = [ 720 0 0 degtorad(theta(2))];
links(3,:) = [ 805 0 0 degtorad(theta(3))];
% links(4,:) = [ 0    0 0   theta(4)];
% links(5,:) = [ 0  -90 0   theta(5)];
% links(6,:) = [ 0   90 0   theta(6)];
%get the A and T matrix
A = getA(links)
T = getT(A)

%plot
figure(1);
title('theta3 = pi')
plotArm(T)
%

hold on;

    for theta2 = -50:5:50
        for theta3 = -45:5:45
            theta = [0 theta2 theta3 ];
            links(1,:) = [ 150 degtorad(90) 475 degtorad(theta(1))];
            links(2,:) = [ 720 0 0 degtorad(theta(2)+90)];
            links(3,:) = [ 805 0 0 degtorad(theta(3)-90 )];

            %get the A and T matrix
            A = getA(links);
            T = getT(A);
            plot3( T(1,4,end),0,T(3,4,end)-50,'g*');
        end
    end
%
%


A(:,:,1) =

    1.0000         0         0  150.0000
         0    0.0000   -1.0000         0
         0    1.0000    0.0000  475.0000
         0         0         0    1.0000
```

```
A(:,:,2) =

    0.0000   -1.0000         0    0.0000
    1.0000    0.0000         0  720.0000
         0         0    1.0000         0
         0         0         0    1.0000


A(:,:,3) =

    0.0000    1.0000         0    0.0000
   -1.0000    0.0000         0 -805.0000
         0         0    1.0000         0
         0         0         0    1.0000


T(:,:,1) =

    1.0000         0         0  150.0000
         0    0.0000   -1.0000         0
         0    1.0000    0.0000  475.0000
         0         0         0    1.0000


T(:,:,2) =

   1.0e+03 *

    0.0000   -0.0010         0    0.1500
    0.0000    0.0000   -0.0010    0.0000
    0.0010    0.0000    0.0000    1.1950
         0         0         0    0.0010


T(:,:,3) =

   1.0e+03 *

    0.0010         0         0    0.9550
         0    0.0000   -0.0010    0.0000
         0    0.0010    0.0000    1.1950
         0         0         0    0.0010
```




```
clear all;
close all;
clc;
%links = zeros(3,4);
%A = ones(4,4,length(links(:,1)));
%T = ones(4,4,length(links(:,1)));

%go to home
syms theta1 theta2 theta3 a1 a2 a3 d1
theta = [ theta1 theta2  theta3 ];
links(1,:) = [ a1  90 d1 theta1];
links(2,:) = [ a2  0 0   theta2];
links(3,:) = [ a3  0 0   theta3];
A = getA(links)
T = getT(A)
```

```
A(:,:,1) =

[ cos(theta1), -cos(90)*sin(theta1),  sin(90)*sin(theta1),
 a1*cos(theta1)]
[ sin(theta1),  cos(90)*cos(theta1), -sin(90)*cos(theta1),
 a1*sin(theta1)]
[           0,              sin(90),              cos(90),
  d1]
[           0,                    0,                    0,
   1]
```

```
A(:,:,2) =

[ cos(theta2), -sin(theta2), 0, a2*cos(theta2)]
[ sin(theta2),  cos(theta2), 0, a2*sin(theta2)]
[           0,            0, 1,              0]
[           0,            0, 0,              1]


A(:,:,3) =

[ cos(theta3), -sin(theta3), 0, a3*cos(theta3)]
[ sin(theta3),  cos(theta3), 0, a3*sin(theta3)]
[           0,            0, 1,              0]
[           0,            0, 0,              1]


T(:,:,1) =

[ cos(theta1), -cos(90)*sin(theta1),  sin(90)*sin(theta1),
 a1*cos(theta1)]
[ sin(theta1),  cos(90)*cos(theta1), -sin(90)*cos(theta1),
 a1*sin(theta1)]
[           0,              sin(90),              cos(90),
  d1]
[           0,                    0,                    0,
   1]


T(:,:,2) =

[ cos(theta1)*cos(theta2) - cos(90)*sin(theta1)*sin(theta2),
 - cos(theta1)*sin(theta2) - cos(90)*cos(theta2)*sin(theta1),
 sin(90)*sin(theta1), a1*cos(theta1) + a2*cos(theta1)*cos(theta2) -
 a2*cos(90)*sin(theta1)*sin(theta2)]
[ cos(theta2)*sin(theta1) + cos(90)*cos(theta1)*sin(theta2),
  cos(90)*cos(theta1)*cos(theta2) - sin(theta1)*sin(theta2), -
sin(90)*cos(theta1), a1*sin(theta1) + a2*cos(theta2)*sin(theta1) +
 a2*cos(90)*cos(theta1)*sin(theta2)]
[                                    sin(90)*sin(theta2),
                                sin(90)*cos(theta2),
 cos(90),                                                    d1 +
 a2*sin(90)*sin(theta2)]
[                                                        0,
                                                    0,
 0,
            1]


T(:,:,3) =

[ cos(theta3)*(cos(theta1)*cos(theta2)
 - cos(90)*sin(theta1)*sin(theta2)) -
```

```
 sin(theta3)*(cos(theta1)*sin(theta2)
 + cos(90)*cos(theta2)*sin(theta1)), -
 cos(theta3)*(cos(theta1)*sin(theta2)
 + cos(90)*cos(theta2)*sin(theta1)) -
 sin(theta3)*(cos(theta1)*cos(theta2) -
 cos(90)*sin(theta1)*sin(theta2)),  sin(90)*sin(theta1),
 a1*cos(theta1) + a2*cos(theta1)*cos(theta2)
 + a3*cos(theta3)*(cos(theta1)*cos(theta2)
 - cos(90)*sin(theta1)*sin(theta2)) -
 a3*sin(theta3)*(cos(theta1)*sin(theta2)
 + cos(90)*cos(theta2)*sin(theta1)) -
 a2*cos(90)*sin(theta1)*sin(theta2)]
[ cos(theta3)*(cos(theta2)*sin(theta1)
 + cos(90)*cos(theta1)*sin(theta2)) -
 sin(theta3)*(sin(theta1)*sin(theta2)
 - cos(90)*cos(theta1)*cos(theta2)), -
 cos(theta3)*(sin(theta1)*sin(theta2)
 - cos(90)*cos(theta1)*cos(theta2)) -
 sin(theta3)*(cos(theta2)*sin(theta1) +
 cos(90)*cos(theta1)*sin(theta2)), -sin(90)*cos(theta1),
 a1*sin(theta1) + a2*cos(theta2)*sin(theta1)
 + a3*cos(theta3)*(cos(theta2)*sin(theta1)
 + cos(90)*cos(theta1)*sin(theta2)) -
 a3*sin(theta3)*(sin(theta1)*sin(theta2)
 - cos(90)*cos(theta1)*cos(theta2)) +
 a2*cos(90)*cos(theta1)*sin(theta2)]
[
                         sin(90)*cos(theta2)*sin(theta3) +
 sin(90)*cos(theta3)*sin(theta2),

 sin(90)*cos(theta2)*cos(theta3) - sin(90)*sin(theta2)*sin(theta3),
             cos(90),

                                                    d1 +
 a2*sin(90)*sin(theta2) + a3*sin(90)*cos(theta2)*sin(theta3) +
 a3*sin(90)*cos(theta3)*sin(theta2)]
[

     0,

               0,                   0,


                                                              1]
```

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