```matlab
%Animate robot arm as it traces the paths of letters A and B

clear

mdl_simple6                    %load the model s6

s6.name='6-DOF ARM with Spherical Wrist'

title('Ali Güner Bekir');

s6.tool = SE3(0, 0, 0.5);          %define tool frame as 50mm translated from wrist center in z6
direction

qz=[0,0,0,0,0,0]               %robot arm with all joint angles equal zero

Tz=s6.fkine(qz)                %pose of the robot associated with all zero joint angles

disp("Robot arm at its pose with all zero joint angles.")

s6.plot(qz)                    %plot the robot arm with congiguration qz

pause(3)

hold on

disp("Robot arm poses to be used to draw and trace letters A and B.")

%Poses of the robot arm at start and end points of the segments in drawing the letters A and B

%Poses used for the letter B

 T1=[0  0  1  -1.25;
    0  1  0  1.0;
   -1  0  0  -0.5;
    0  0  0  1.0]

 T2=[0  0  1  -1.25;
    0  1  0  1.0;
   -1  0  0  1.5;
    0  0  0  1.0]

 T3=[0  0  1  -1.25;
    0  1  0  1.0;
   -1  0  0  1.5;
    0  0  0  1.0]

 T4=[0  0  1  -0.25;
     0  1  0  1.0;
    -1  0  0  1.0;
```

```
            0  0  0   1.0]
T5=[0  0  1  -0.25;
    0  1  0   1.0;
    -1  0  0   1.0;
     0  0  0   1.0]
T6=[0  0  1  -1.25;
    0  1  0   1.0;
    -1  0  0   0.5;
     0  0  0   1.0]
T7=[0  0  1   -1.25;
    0  1  0   1.0;
    -1  0  0   0.5;
     0  0  0   1.0]
T8=[0  0  1  -0.25;
    0  1  0   1.0;
    -1  0  0    0;
     0  0  0   1.0]
T9=[0  0  1  -0.25;
    0  1  0   1.0;
    -1  0  0    0;
     0  0  0   1.0]
T10=[0  0  1  -1.25;
    0  1  0   1.0;
    -1  0  0  -0.5;
     0  0  0   1.0]
```

%Poses used for the capital letter A

T11=[0 0 1 1.0;

  0 1 0 0.0;

  -1 0 0 -1.0;

  0 0 0 1.0]

T12=[0 0 1 1.0;

  0 1 0 -1.0;

  -1 0 0 1.0;

  0 0 0 1.0]

T13=[0 0 1 1.0;

  0 1 0 -1.0;

  -1 0 0 1.0;

  0 0 0 1.0]

T14=[0 0 1 1.0;

  0 1 0 -2.0;

  -1 0 0 -1.0;

  0 0 0 1.0]

T15=[0 0 1 1.0;

  0 1 0 -0.5;

  -1 0 0 0.0;

  0 0 0 1.0]

T16=[0 0 1 1.0;

  0 1 0 -1.5;

  -1 0 0 0.0;

  0 0 0 1.0]

```matlab
disp("Robot arm joint angles associated with the poses used to draw and trace letters A and B.")

%Find robot arm joint angles associated with poses T1..T8 using inverse kinematics

q1=s6.ikine6s(T1)

q2=s6.ikine6s(T2)

q3=s6.ikine6s(T3)

q4=s6.ikine6s(T4)

q5=s6.ikine6s(T5)

q6=s6.ikine6s(T6)

q7=s6.ikine6s(T7)

q8=s6.ikine6s(T8)

q9=s6.ikine6s(T9)

q10=s6.ikine6s(T10)

q11=s6.ikine6s(T11)

q12=s6.ikine6s(T12)

q13=s6.ikine6s(T13)

q14=s6.ikine6s(T14)

q15=s6.ikine6s(T15)

q16=s6.ikine6s(T16)


%Plot robot arm poses associated with poses T1 .. T8

disp("Robot arm at its first pose.")

s6.plot(q1)

pause(1);

s6.plot(q2)

pause(1);

s6.plot(q3)

pause(1);

s6.plot(q4)

pause(1);

s6.plot(q5)

pause(1);
```

```
s6.plot(q6)

pause(1);

s6.plot(q7)

pause(1);

s6.plot(q8)

pause(1);

s6.plot(q9)

pause(1);

s6.plot(q10)

pause(1);

s6.plot(q11)

pause(1);

s6.plot(q12)

pause(1);

s6.plot(q13)

pause(1);

s6.plot(q14)

pause(1);

s6.plot(q15)

pause(1);

disp("Robot arm at its last pose. Press a key to continue..")

s6.plot(q16)

pause(1);




Nstep=25;                       %number of steps on straight line path


Tc=ctraj(T1,T2,Nstep);              %compute a straight line Cartesian path between T1 and T2

pc=transl(Tc);                   %obtain translational part at each pose of the Cartesian path

plot3(pc(:,1),pc(:,2),pc(:,3),'m','LineWidth', 2)   %plot the straight line path between poses T1 and T2
```

```matlab
qc1=s6.ikine6s(Tc);                    %find joint angles associated with each pose on the path

%s6.plot(qc1)

pause(1)

%hold on


Tc=ctraj(T3,T4,Nstep);

pc=transl(Tc);

plot3(pc(:,1),pc(:,2),pc(:,3),'m','LineWidth', 2)

qc2 = s6.ikine6s(Tc);

%s6.plot(qc2)

pause(1)


Tc=ctraj(T5,T6,Nstep);

pc=transl(Tc);

plot3(pc(:,1),pc(:,2),pc(:,3),'m','LineWidth', 2)

qc3 = s6.ikine6s(Tc);

%s6.plot(qc3)

pause(1)


Tc=ctraj(T7,T8,Nstep);

pc=transl(Tc);

plot3(pc(:,1),pc(:,2),pc(:,3),'m','LineWidth', 2)

qc4 = s6.ikine6s(Tc);

%s6.plot(qc3)

pause(1)


Tc=ctraj(T9,T10,Nstep);

pc=transl(Tc);

plot3(pc(:,1),pc(:,2),pc(:,3),'m','LineWidth', 2)

qc5 = s6.ikine6s(Tc);

%s6.plot(qc3)
```

```matlab
    pause(1)


Tc=ctraj(T11,T12,Nstep);
pc=transl(Tc);
plot3(pc(:,1),pc(:,2),pc(:,3),'m','LineWidth', 2)
qc6 = s6.ikine6s(Tc);
pause(1)


Tc=ctraj(T13,T14,Nstep);
pc=transl(Tc);
plot3(pc(:,1),pc(:,2),pc(:,3),'m','LineWidth', 2)
qc7 = s6.ikine6s(Tc);
pause(1)


Tc=ctraj(T15,T16,Nstep);
pc=transl(Tc);
plot3(pc(:,1),pc(:,2),pc(:,3),'m','LineWidth', 2)
qc8 = s6.ikine6s(Tc);
pause(1)
qc=[qc1;qc2;qc3;qc4;qc5;qc6;qc7;qc8];           %all joint angles along all straight line paths
s6.plot(qc)                  %animate the robot arm as it moves along the paths
%Record the project animation
s6.plot(qc,'delay',0.2, 'movie','prjEEM418.mp4')
```