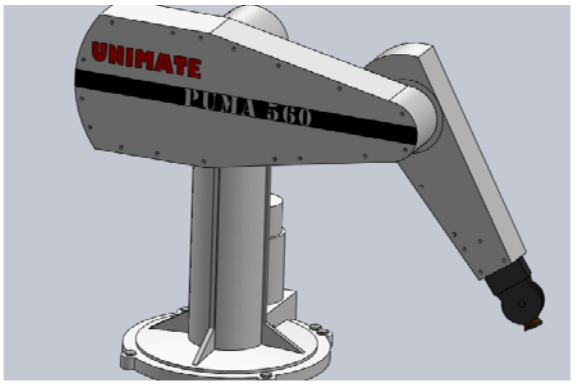
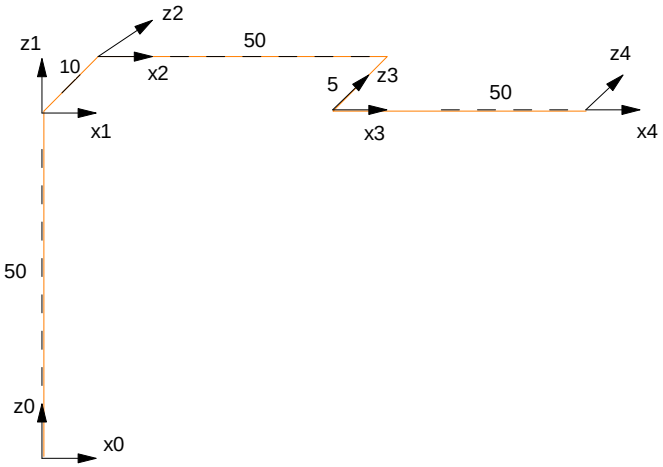
ECE 761 - Homework #7

Forward Kinematics & Inverse Kinematics of a Puma Robot

RRR Robot





1) Create a forward kinematics program for the case when d2 + d3 ≠ 0

Link i	α_{i-1} The angle between the Zi-1 and Zi axis (twist)	a_{i-1} The distance from Zi-1 to Zi measured along the Xi-1 axis	d_i The distance from Xi-1 to Xi measured along the Zi axis	θ_i The angle between Xi-1 and Xi measured about the Zi axis
1				
2				
3				
4 (tip)				

2) Create an inverse-kinematics program for this case

3) Verify your inverse kinematics works by trying a few points

```
>> Q = InverseRRR2([10,20,30])

    0.8816
   -0.5280
    2.5410

>> XYZ = RRR2(Q, TIP)

   10.0000
   20.0000
   30.0000
    1.0000
```

4) Show the robot's motion as it traces out a shape (such as a star, square, triangle, etc) (RRR_Simulation.m)

```
% units = meters

t = [0:0.01:1]';
z = 0*t;

xt = [ z;  z  ;  z  ;  z ] + 50;
yt = [ t; z+1 ; 1-t ;  z ]*50 - 25;
zt = [ z;  t  ; 1+z ; 1-t]*50 - 20;

% units = cm

TIP = [xt'; yt'; zt'; (xt.^0)'];


npt = length(t);

for i=1:npt

   Q = InverseRRR(TIP(:,i));
   RRR(Q, TIP);

   end
```