2 Arm Kinematics

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Source Code

func/fkin.m

```
1  #forward kinematics for a N joint endeffector
2  function [r,theta,gamma] = fkin(A)
3
4          gamma = 0;
5          z = 0;
6          for i = 1:columns(A)
7                  gamma += A(2,i);
8                  z += A(1,i)*[cos(gamma); sin(gamma)];
9          endfor
10
11         #store the length and theta for p
12         r = sqrt(z(1)^2+z(2)^2);
13         theta = atan2(z(2),z(1));
14 endfunction
```

func/rkin.m

```
1  #reverse kinematics for a two joint endofactor
2  #returns NaN if p and l are invalid values
3  function T = rkin(p,l)
4
5          #find location of last joint
6          x = p(1);
7          y = p(2);
8          a = l(1);
9          b = l(2);
10
11         #solve for theta2
12         d = 2*a*b;
13         f = x^2+y^2-a^2-b^2;
14
```

```
15          #check for impossible values
16          if (f > d)
17                  T = NaN
18                  return
19          endif
20
21          c2 = f/d;
22          theta2 = acos(c2);
23
24          s2 = sin(theta2);
25
26          #solve for theta1
27          A = [a + b*c2, -b*s2,p(1); b*s2, a+b*c2,p(2)];
28
29          r = rref(A)*[0;0;1];
30
31          theta1 = atan2(r(2),r(1));
32
33          #solve for thetb1,2
34          thetb1 = 2*atan2(p(2),p(1))-theta1;
35          thetb2 = -theta2;
36
37          T = [theta1,thetb1;theta2,thetb2];
38  endfunction
```

script/asn3.m

```
1  a = 1;
2  b = 1;
3
4  anglea = -pi/6
5  angleb = pi/4
6
7  [r,t,g] = fkin([a,b;anglea,angleb])
8
9  rx = r*cos(t)
10 ry = r*sin(t)
11
12 A = rkin([rx;ry],[a;b])
13
14 [r1,t1,g1] = fkin([a,b;A(1,1),A(2,1)])
15 [r2,t2,g2] = fkin([a,b;A(1,2),A(2,2)])
```

Output of asn3.m

```
octave:3> asn3
anglea = -0.52360
angleb =  0.78540
r =  1.8478
t = -0.13090
g =  0.26180
rx =  1.8320
ry = -0.24118
A =

  -0.52360   0.26180
   0.78540  -0.78540

r1 =  1.8478
t1 = -0.13090
g1 =  0.26180
r2 =  1.8478
t2 = -0.13090
g2 = -0.52360
octave:4>
```