Milling and Welding Todo

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Link: https://drive.matlab.com/sharing/49eb5fa6-0641-425c-a130-9cf41b2e1058

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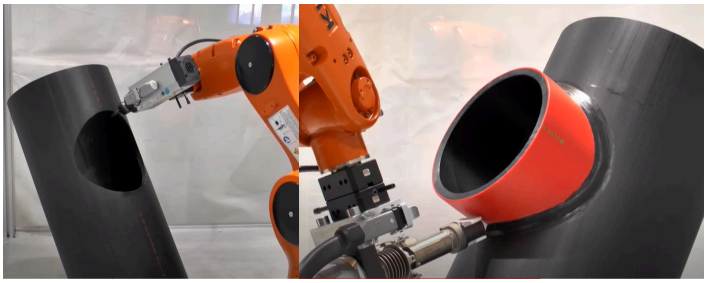
See the video: https://youtu.be/cVZWm9ORY30

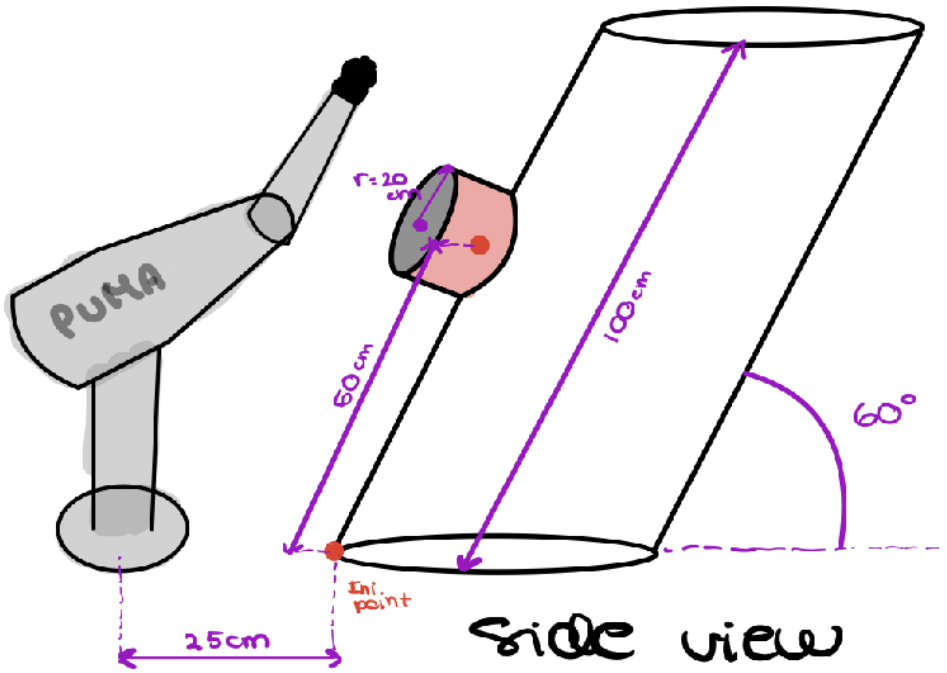
As you can see in the video a Robot Arm perform three task. Only two tasks are shown:

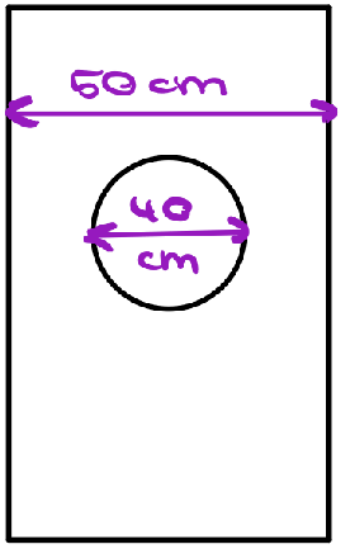
1. Make a hole in a cylinder by drilling it. Observe that the tool mantain the same pose during the drilling task.
2. Insertion of a smaller cylinder not recorder here.
3. Welding the two cylinder. Observe that the tool always form a 45º among the two cylinder axis

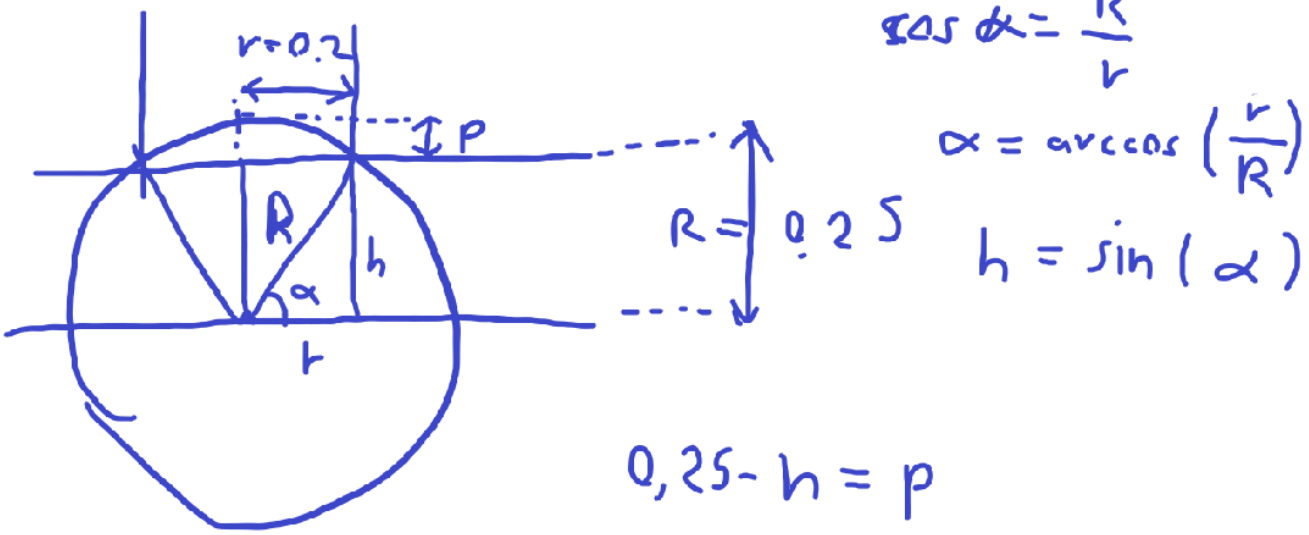


Sketching your ideas

Conceptualize the problem. Add a sketch and make some small scripts







dist = (-(p/2)*cos(4pi*iter))+(p/2)

Parte 1 - Drill

Primero calcularemos el agujero hecho con el taladro.

Calculo del punto central del circulo

En base a la información que tenemos del sketch, calculamos el punto central del circulo a taladrar.

```
clc;
clear;
close all;
radius = 0.20; % 20 cm

INI_POINT = [0.25; 0; 0]
```

```
INI_POINT = 3×1
    0.2500
         0
         0
```

```
dist_from_ini = 0.4 % 1 meter
```

```
dist_from_ini = 0.4000
```

```
CENTER_CIRCLE = INI_POINT+[dist_from_ini*cos(pi/3); 0; dist_from_ini*sin(pi/3)]
```

```
CENTER_CIRCLE = 3×1
    0.4500
         0
    0.3464
```

Calculo de la rotación

```
n = 200; % Number of iterations
INI_ROBOT = transl(CENTER_CIRCLE(1), CENTER_CIRCLE(2), CENTER_CIRCLE(3));

big_radius = 0.25
```

```
big_radius = 0.2500
```

```
angle_of_joint = acos(radius/big_radius);
height_of_joint = big_radius*sin(angle_of_joint)
```

```
height_of_joint = 0.1500
```

```
profundity = (big_radius - height_of_joint)/2
```

```
profundity = 0.0500
```

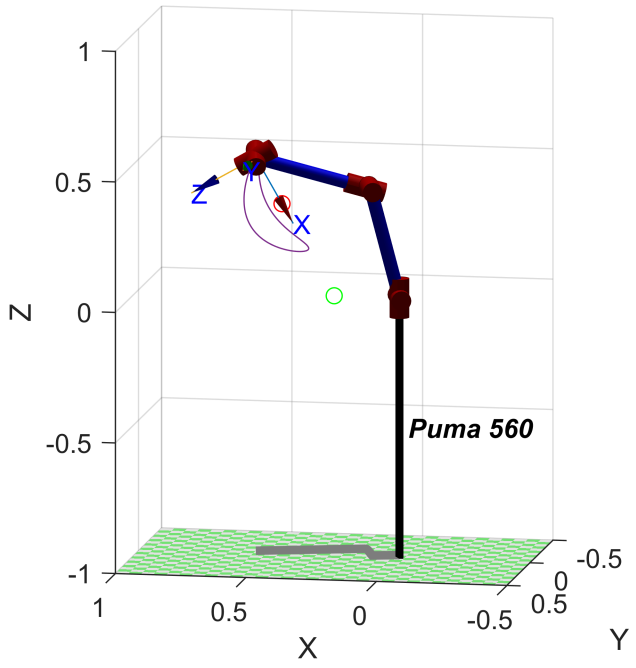
```
for i=1:n
 Laser_Pose(:,:,i)= INI_ROBOT*troty(2*pi/3)* ...
     transl(0, 0, (-profundity*cos(4*pi*i/n))+profundity)* ...
     trotz(2*pi*i/n)*transl(-radius, 0, 0) ...
 ;
end
```

Plot de trazado resultante y puntos de referencia

```
mdl_puma560
Q = p560.ikine6s(Laser_Pose, 'run');
p560.plot(Q,'trail','-','view',[-170 10], 'zoom',1.5,'workspace', [-0.5 1 -0.5 0.5 -1 1])

hold on;
```

```
plot3(INI_POINT(1), INI_POINT(2), INI_POINT(3),'-go');
plot3(CENTER_CIRCLE(1), CENTER_CIRCLE(2), CENTER_CIRCLE(3),'-ro');
hold off;
```



Parte 2 - Soldar

Una vez calculado el taladro, la siguiente parte es soldar una vez colocada la tuberia. Para ello deberemos soldar a 45º.

```
clc;
close all;
radius=0.20; % 20 cm

INI_POINT = [0.25; 0; 0]
```

```
INI_POINT = 3×1
    0.2500
         0
         0
```

```
dist_from_ini = 0.4 % 1 meter
```

```
dist_from_ini = 0.4000
```

```
CENTER_CIRCLE = INI_POINT+[dist_from_ini*cos(pi/3); 0; dist_from_ini*sin(pi/3)]
```

```
CENTER_CIRCLE = 3×1
    0.4500
         0
```

```
0.3464
```

Calculo de la rotación

A diferencia del taladro, ahora el robot debe soldar a 45º.

```
n=200; % Number of iterations
INI_ROBOT = transl(CENTER_CIRCLE(1), CENTER_CIRCLE(2), CENTER_CIRCLE(3));

big_radius = 0.25
```

```
big_radius = 0.2500
```

```
angle_of_joint = acos(radius/big_radius);
height_of_joint = big_radius*sin(angle_of_joint)
```

```
height_of_joint = 0.1500
```

```
profundity = (big_radius - height_of_joint)/2
```

```
profundity = 0.0500
```

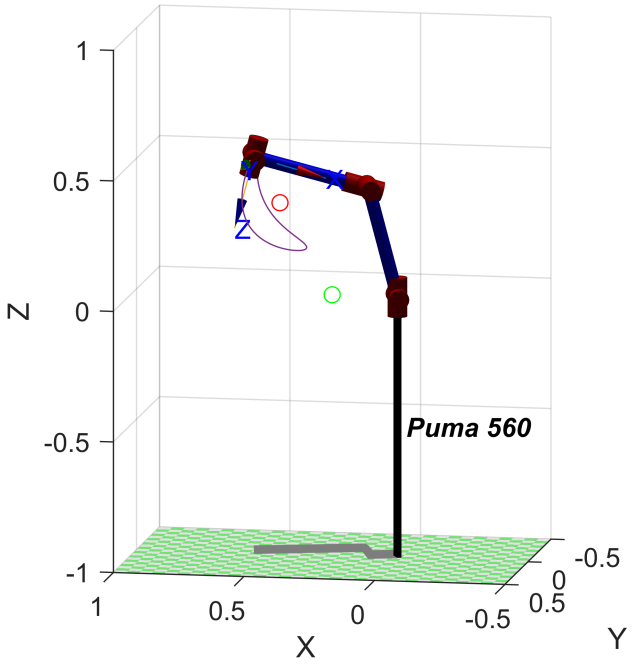
```


for i=1:n
    Laser_Pose(:,:,i)= INI_ROBOT*troty(2*pi/3)* ...
        transl(0, 0, (-profundity*cos(4*pi*i/n))+profundity)* ...
        trotz(2*pi*i/n)*transl(-radius, 0, 0)*troty(pi/4) ...
    ;
end
```

Plot de trazado resultante y puntos de referencia

```
mdl_puma560
Q = p560.ikine6s(Laser_Pose, 'run');
p560.plot(Q,'trail','-','view',[-170 10], 'zoom',1.5,'workspace', [-0.5 1 -0.5 0.5 -1 1])

hold on;
plot3(INI_POINT(1), INI_POINT(2), INI_POINT(3),'-go');
plot3(CENTER_CIRCLE(1), CENTER_CIRCLE(2), CENTER_CIRCLE(3),'-ro');
hold off;
```


Puma 560
Z
X
Y
1
0.5
0
-0.5
-1
1
0.5
0
-0.5
-0.5
0
0.5