Map Building Laser Based

Grup 11-H:

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Link: https://drive.matlab.com/sharing/b8a7f88a-dcb6-4c09-a328-ba6c7e737807

```
clear
clf
load ("Sensor_Data.mat")
```

Robot parameters

```
d_lr = 0.6
```

```
d_lr = 0.6000
```

```
S = 0.26
```

```
S = 0.2600
```

```
r = 0.1
```

```
r = 0.1000
```

```
Ts = 0.02 %Ts=0.02 r and l
```

```
Ts = 0.0200
```

```
NR = 100 %gear_ratio
```

```
NR = 100
```

```


L_inc = left_angular_speed(:,2)*r*Ts/NR
```

```
L_inc = 3004×1
     0
     0
     0
     0
     0
     0
     0
     0
     0
     0
     0
     ⋮
```

```
R_inc = right_angular_speed(:,2)*r*Ts/NR
```

```
R_inc = 3004×1
```

```
     0
     0
     0
     0
     0
     0
     0
     0
     0
     0
     ⋮
```

```
delta_d=(R_inc+L_inc)/2
```

```
delta_d = 3004×1
     0
     0
     0
     0
     0
     0
     0
     0
     0
     0
     ⋮
```

```
delta_t=(R_inc-L_inc)/(2*S)
```

```
delta_t = 3004×1
     0
     0
     0
     0
     0
     0
     0
     0
     0
     0
     ⋮
```

Trajectory Calculation

```
Robot_pose=transl(0,0,0)*trotz(-pi/2) %posicio inicial del robot
```

```
Robot_pose = 4×4
     0     1     0     0
    -1     0     0     0
     0     0     1     0
     0     0     0     1
```

```
Pose(:,:,1)=Robot_pose;
for i=1:length(L_inc)-1
    Pose(:,:,i+1)=Pose(:,:,i)*transl(delta_d(i),0,0)*trotz(delta_t(i));
    Position(:,i+1)=transl(Pose(:,:,i));
    Orientation(:,i+1)=tr2rpy(Pose(:,:,i));
```

```
end
```

Plotting trajectory

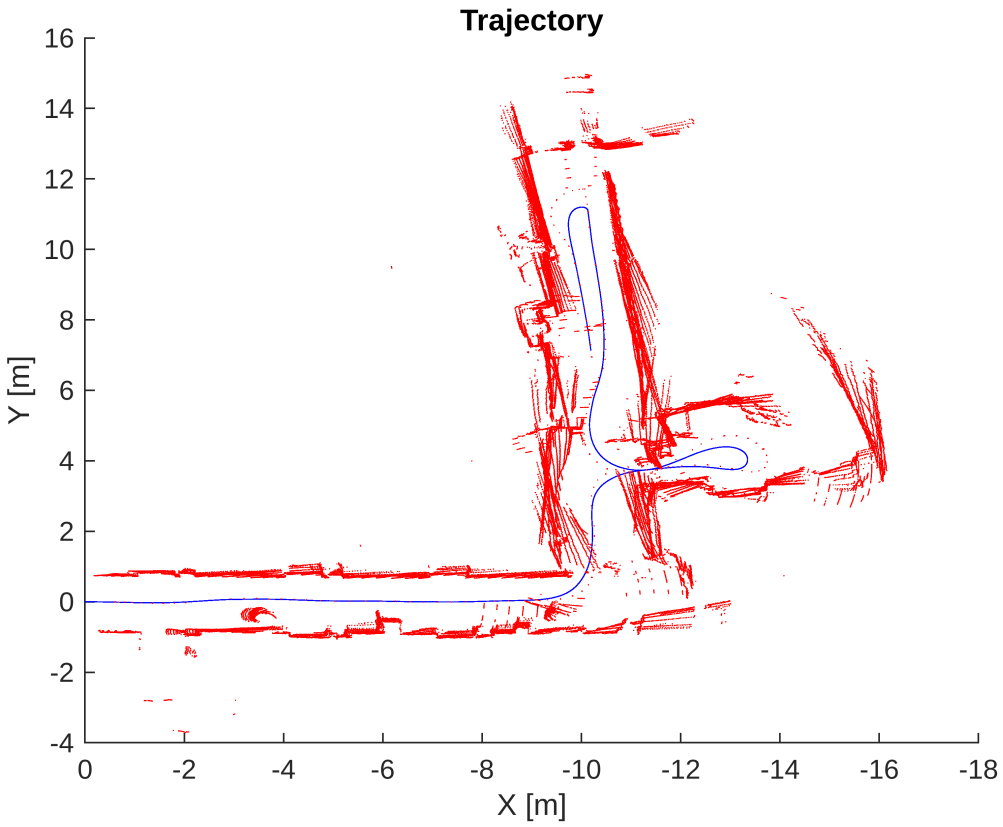
```
figure
hold on
plot(Position(1,2:end),Position(2,2:end),'b.','MarkerSize',1)
view(-90,90)
title('Trajectory')
ylabel('X [m]')
xlabel('Y [m]')
```

Building the Map

```
ang_laser=linspace(-120*pi/180,120*pi/180,682)
```

```
ang_laser = 1×682
   -2.0944   -2.0882   -2.0821   -2.0759   -2.0698   -2.0636   -2.0575   -2.0513 ···
```

```
for i=1:149
    %coordenades polars -> cartesianes amb pol2cart
    [x y] = pol2cart(ang_laser, polar_laser_data(i,2:683)/1000); %estava en
mm
    pointsL = [x; y; zeros(1,682); ones(1,682)];
    for j=1:682
        if(pointsL(1,j) ~= 0 || pointsL(2,j) ~= 0)
            pointsR = transl(d_lr,0,0)*pointsL(:,j);
            %polar_laser_data -> Ts=0.4; left/right w speed -> Ts=0.02
            pointsU = Pose(:,:,i*(0.4/0.02))*pointsR;
            plot(pointsU(1),pointsU(2),'r.','MarkerSize',1)
            view(-90,90)
        end
    end
end
hold off
```


Trajectory
16
14
12
10
8
6
4
2
0
-2
-4
Y [m]
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
X [m]