

Map Building Laser Based

Grup 11-H:

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

```
clear
close all
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;
R_inc = right_angular_speed(:,2)*r*Ts/NR;

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

Trajectory Calculation

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

```
Robot_pose = 4x4
    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) * troz(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)
title('Trajectory')
ylabel('X [m]')
xlabel('Y [m]')
```

Building the Map

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

```
ang_laser = 1x682
    -2.0944    -2.0882    -2.0821    -2.0759    -2.0698    -2.0636    -2.0575    -2.0513 ...
```

```
% % Laser_dist=polar_laser_data(1,2:683)% First and last column are time
% % x_l=cos(ang_laser).*Laser_dist
% % y_l=sin(ang_laser).*Laser_dist
% % Laser_mapped=Robot_pose*[x_l;y_l;zeros(1,682);ones(1,682)]
% % scatter(Laser_mapped(1,:), Laser_mapped(2,:))

for i = 1:130
    %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)
        end
    end
end
end
```

