
Table of Contents

ME 179D Prelab 2b - Alex Nguyen	1
Constants	1
Constructing Ellipse	1
Point for Omnibot to Face	1
Initial Omnibot Direction	1
Omnibot Coordinates	1
Plotting Results	2

ME 179D Prelab 2b - Alex Nguyen

```
clc; clear; close all;
```

Constants

```
rw = 0.032; %wheel radius [m]
L = 0.146; %length to the wheel from the body coordinate [m]
a = (2*pi/3)*[-1 0 1]; %alpha angles [rad]
n = 200; %number of discretized points
```

Constructing Ellipse

```
r1 = 0.3048; %ellipse minor axis [m]
r2 = 0.6096; %ellipse major axis [m]
xc = 0; yc = 0.6096; %center of ellipse

w = linspace(-pi/2, pi/2, n);
x = r1 * cos(w) + xc; %ellipse x-coordinates [m]
y = r2 * sin(w) + yc; %ellipse y-coordinates [m]
```

Point for Omnibot to Face

```
p1 = 0.9144; %x-coordinate [m]
p2 = 0.6096; %y-coordinate [m]
theta = atan((y-p2)./(x-p1)); %target point angle [rad]
phi_b = theta;
```

Initial Omnibot Direction

```
xo = 0; yo = 0; %initial x,y position
m = (p2-yo)/(p1-xo); %slope
b = p2 - m*p1; %y-int [m]
z = 0:0.1:p1;
```

Omnibot Coordinates

```
t = linspace(0,20,n); %time [s]
```

```

dt = t(2)-t(1); %time step [s]
vx = zeros(1,length(x)); vy = zeros(1,length(y)); qdot =
    zeros(3,n); %preallocation

%To have the omnibot angle always face the target point??
for i = 1:length(phi_b)-1
    vx(i) = (x(i+1)-x(i))/dt; %x-velocity [m/s]
    vy(i) = (y(i+1)-y(i))/dt; %y-velocity [m/s]
    xidot = [vx(i); vy(i); 0]; %body coordinate velocities
    F = find_F(phi_b(i));
    qdot(:,i) = F*xidot; %joint velocity
end

% JOINT VELOCITY [rad/s]
m1dot = qdot(1,:); %motor 1 velocity [rad/s]
m2dot = qdot(2,:); %motor 2 velocity [rad/s]
m3dot = qdot(3,:); %motor 3 velocity [rad/s]

% MOTOR ANGLES [rad]
m1 = cumsum(m1dot)*dt; %motor 1 position [rad]
m2 = cumsum(m2dot)*dt; %motor 2 position [rad]
m3 = cumsum(m3dot)*dt; %motor 3 position [rad]

```

Plotting Results

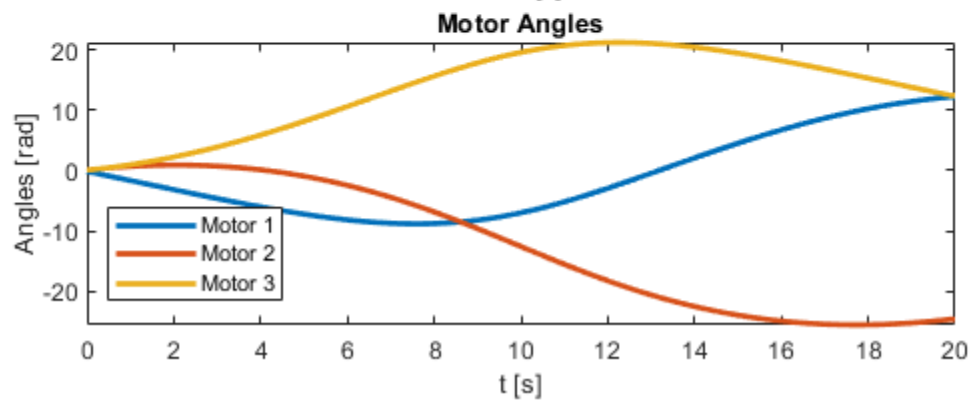
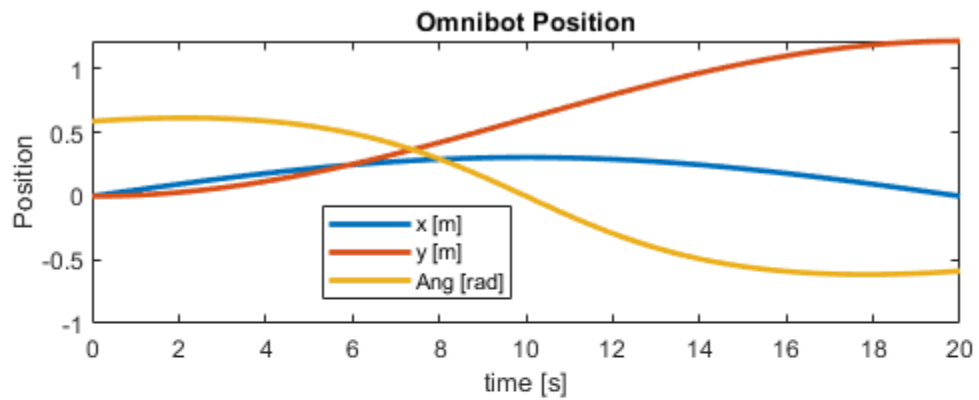
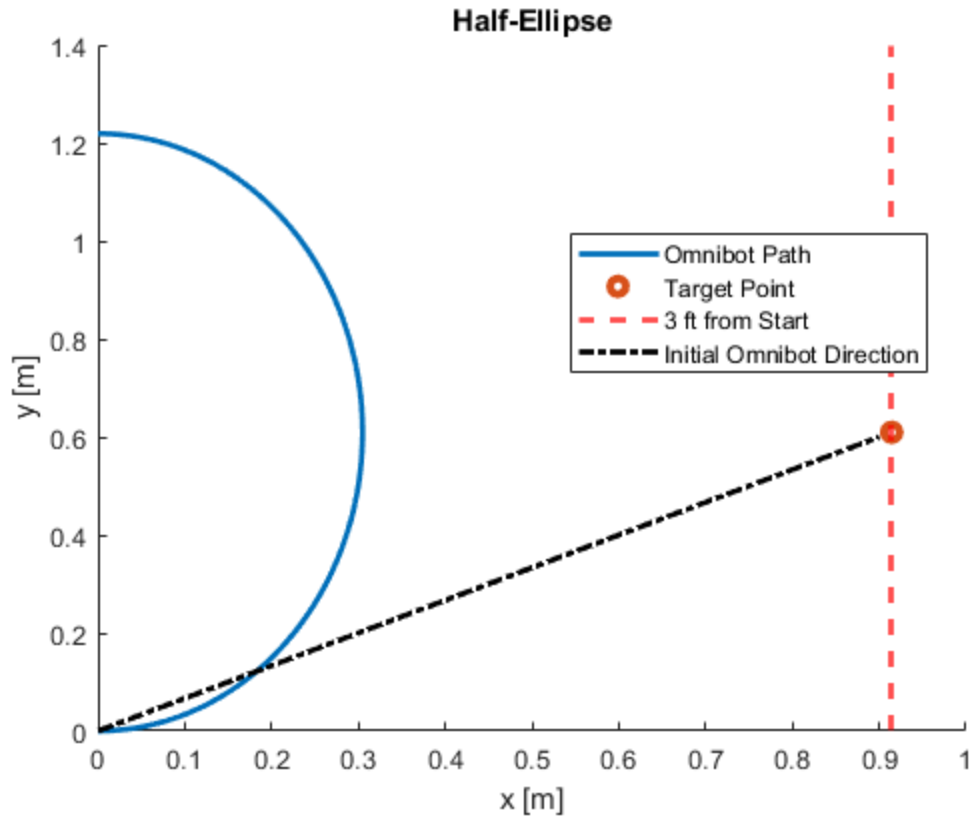
```

figure;
hold on
plot(x,y,'linewidth',2)
plot(p1,p2,'o','linewidth',3)
xline(0.9144,'--r','linewidth',2);
plot(z,m*z,'-.k','linewidth',2)
hold off
xlabel('x [m]')
ylabel('y [m]')
title('Half-Ellipse')
legend('Omnibot Path','Target Point','3 ft from Start', ...
    'Initial Omnibot Direction','location','best')
% axis([0 0.325 0 1.23])

figure;
subplot(2,1,1)
plot(t,x,t,y,t,theta,'linewidth',2)
legend('x [m]','y [m]','Ang [rad]','location','best')
title('Omnibot Position')
ylabel('Position')
xlabel('time [s]')

subplot(2,1,2)
plot(t,m1,t,m2,t,m3,'linewidth',2)
legend('Motor 1','Motor 2','Motor 3','location','best')
title('Motor Angles')
ylabel('Angles [rad]')
xlabel('t [s]')

```



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