

ME766A: Assignment-2

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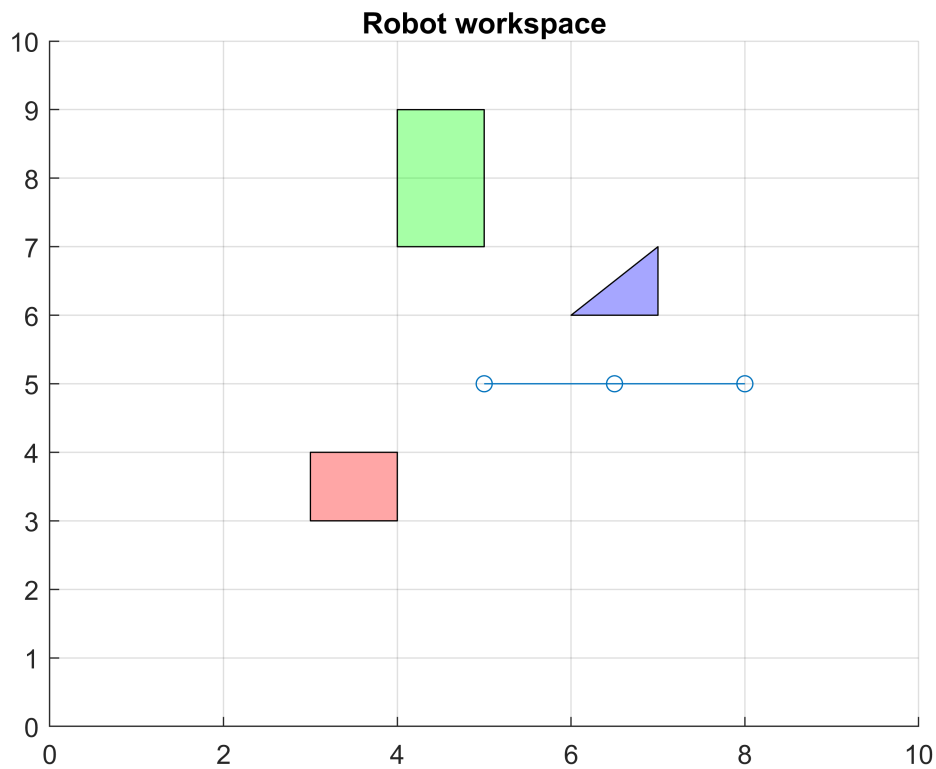
```
% Instructions for running the programme
% *****
% The programme has functions from the Mapping
% Toolbox of MATLAB. You first need to install
% it.
% Then simply run the programme to visualize the
% results.
% Also, note that the current program has iterations
% of 10 degrees. This has been done to reduce the
% total runtime of the simulation.
% In case better configurations are available, the
% simulation can be made for 1 degree iteration as
% well.
%*****

% Defining obstacles in the workspace
pgon1 = polyshape([3 3 4 4],[3 4 4 3]);
pgon2 = polyshape([6 7 7],[6 6 7]);
pgon3 = polyshape([4 5 5 4], [7 7 9 9]);

% Initial parameters for the 2DOF robot
arm_legnth = 1.5;
origin = [5,5];

f1 = figure;
f2 = figure;
f3 = figure;

% Plotting the workspace with the obstacles
% and simulating the torus formation
figure(f3)
axis([0 10 0 10])
title("Robot workspace")
hold on
grid on
scatter([5 6.5 8],[5 5 5])
line([5 6.5],[5 5])
line([6.5 8],[5 5])
plot(pgon1, 'Facecolor', 'r')
plot(pgon2, 'Facecolor', 'b')
plot(pgon3, 'Facecolor', 'g')
hold off
```



```
figure(f1)
axis([0 10 0 10])
title("Torus simulation")
hold on
grid on
plot(pgon1, 'Facecolor', 'r')
plot(pgon2, 'Facecolor', 'b')
plot(pgon3, 'Facecolor', 'g')
hold off

% Simulating the C-space formation
figure(f2)
title("C-Space Simulation")
hold on
xlabel("Theta1")
ylabel("Theta2")
axis([0 2*pi 0 2*pi])

for theta1=1:10:360
    [x1,y1] = calcCoordJoint1(theta1,arm_legnth,origin);
    for theta2=1:10:360
        [x2,y2] = calcCoordJoint2(theta1,arm_legnth, theta2, arm_legnth,origin);
        lineseg = [x1 y1;x2 y2];

        % Plotting the torus
```

```

figure(f1)
hold on
scatter(x2,y2,10,"black");
line([x1 x2],[y1 y2]);
hold off

% Checking the intersection with obstacle 1
[in,~] = intersect(pgon1,lineseg);
if not isempty(in)
    figure(f2)
    scatter(deg2rad(theta1), deg2rad(theta2),'red');
    continue;
end

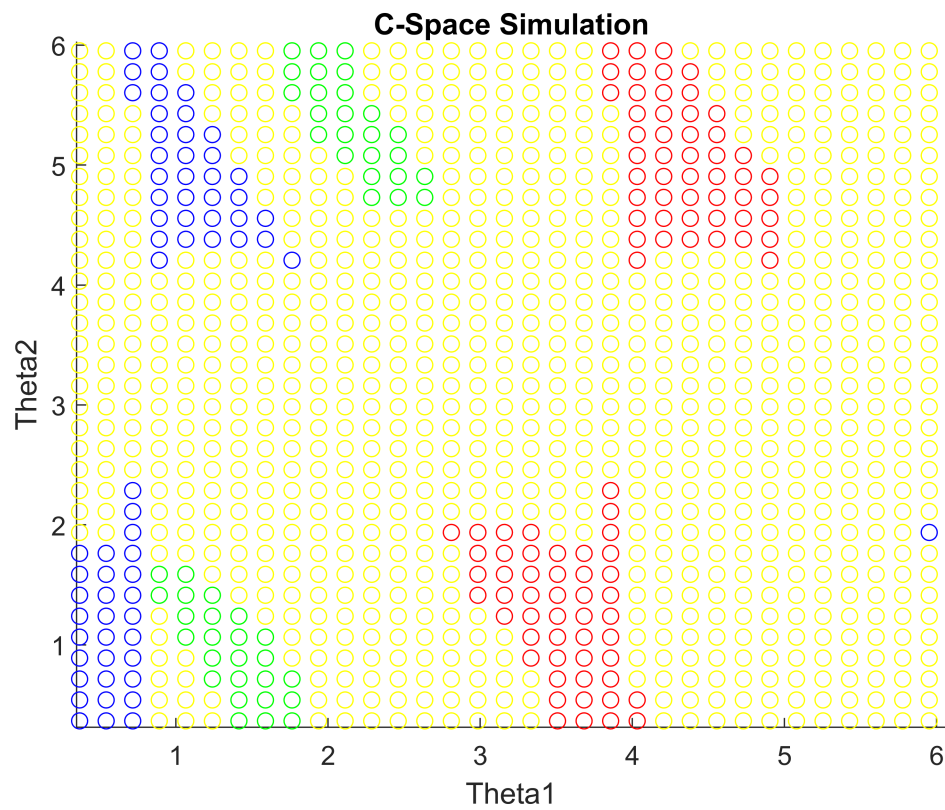
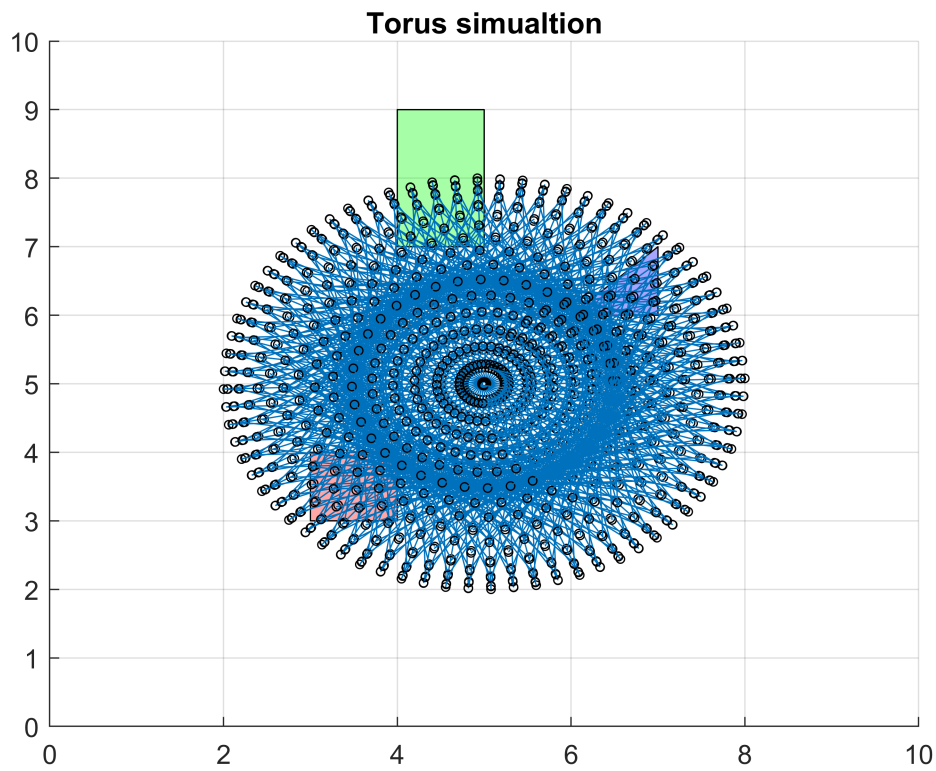
% Checking the intersection with obstacle 2
[in,~] = intersect(pgon2,lineseg);
if not isempty(in)
    figure(f2)
    scatter(deg2rad(theta1), deg2rad(theta2),'blue');
    continue;
end

% Checking the intersection with obstacle 3
[in,~] = intersect(pgon3,lineseg);
if not isempty(in)
    figure(f2)
    scatter(deg2rad(theta1), deg2rad(theta2),'green');
    continue;
end

figure(f2)
scatter(deg2rad(theta1), deg2rad(theta2),'yellow');

pause(0.001);
end
end

```



```
function [x,y] = calcCoordJoint1(theta, arm_length, origin)
    x = origin(1,1) + arm_length*cos(deg2rad(theta));
```

```
    y = origin(1,2) + arm_length*sin(deg2rad(theta));  
end  
  
function [x,y] = calcCoordJoint2(theta1, arm_length1, theta2, arm_length2,origin)  
    x = origin(1,1) + arm_length1*cos(deg2rad(theta1)) + arm_length2*cos(deg2rad(theta1+theta2));  
    y = origin(1,2) + arm_length1*sin(deg2rad(theta1)) + arm_length2*sin(deg2rad(theta1+theta2));  
end
```