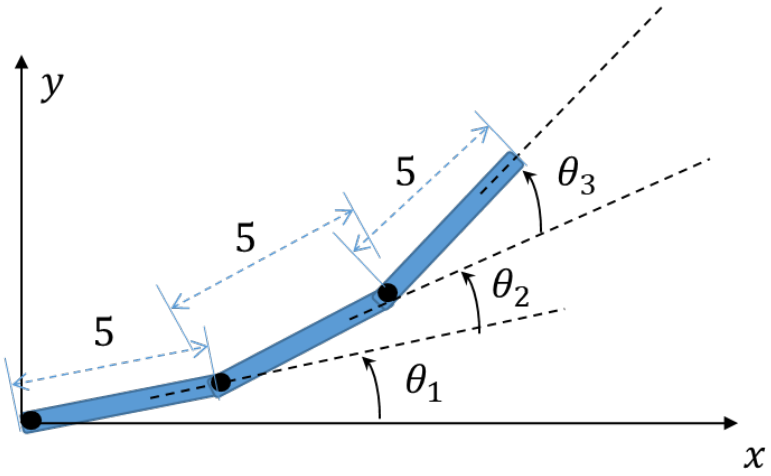
EECS 499

Project #2 Assignment

Motion Planning with RRT-Connect

In this assignment, you are asked to implement the RRT-Connect Algorithm for motion planning of a 3 degrees-of-freedom planar robotic manipulator, with three rotational joints.

The kinematic configuration of the robotic manipulator is shown below:




The configuration space of the robotic manipulator is $T^3$. The links of the robotic manipulator are 5 units long. The robots base is anchored at the origin of the world coordinate frame (0,0) shown above.

There are three circular obstacles placed in the workspace of the robotic manipulator. The obstacles are centered at coordinates (8,0), (8,8), and (8,-8), and they all have radii of 2 units.

In order to simplify the implementation: When checking for collisions, you can ignore the thickness of the robot links, and assume that the robot is constructed such that its links cannot collide with each other. (In other words, you can approximate the robot as composed of three line segments, and check for intersections between these three line segments and the circles corresponding to the obstacles. You do not need to check for collisions between different robot links.)

## Deliverable:

Using your implementation of the RRT-Connect algorithm, find a collision-free path between the following two configurations of the robot:

$$q_{start} = \begin{bmatrix} 0 \\ -0.9273 \\ 0.9273 \end{bmatrix}; \quad q_{goal} = \begin{bmatrix} 0 \\ 0.9273 \\ -0.9273 \end{bmatrix};$$

and provide a visualization of the path generated in the workspace of the robot. The visualization you need to generate should show the start, goal, and all of the intermediate configurations visited by the robot, along with obstacles, in the workspace coordinates (such as the figure shown on the right that we have shown in the Configuration Spaces lectures). Please also provide a pdf printout of your Matlab code as a supplement.