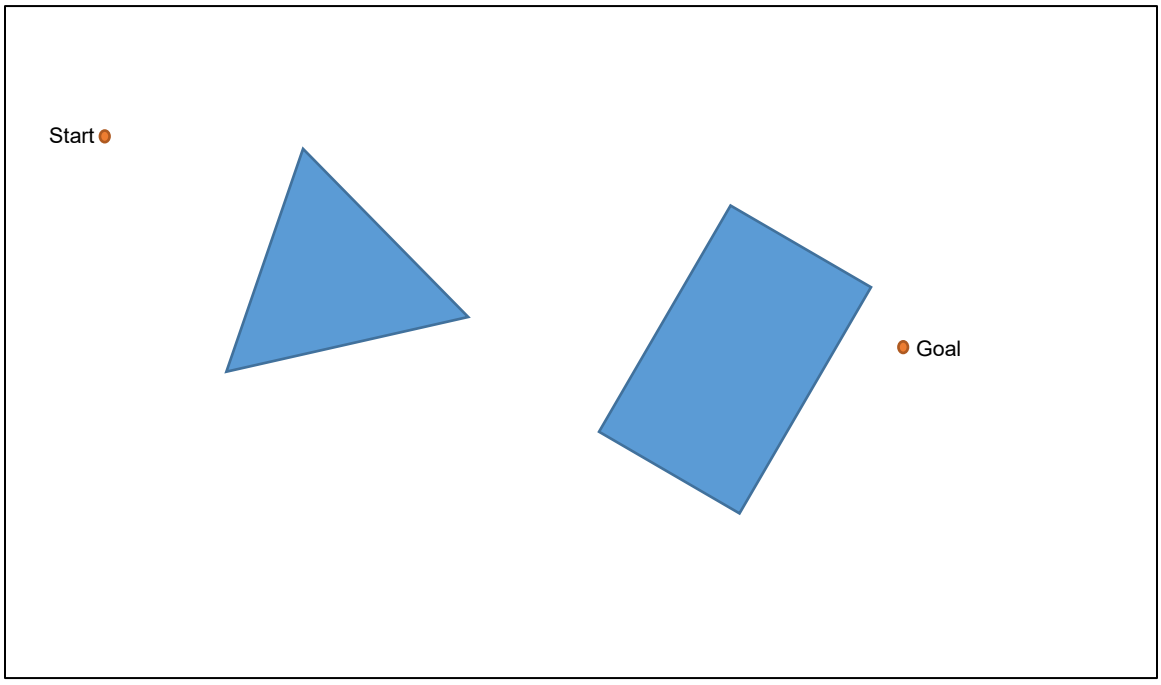
Topics Covered: This assignment covers: Robot Motion Planning.

Must be done independently.

Complete the following problems/answer the following questions.

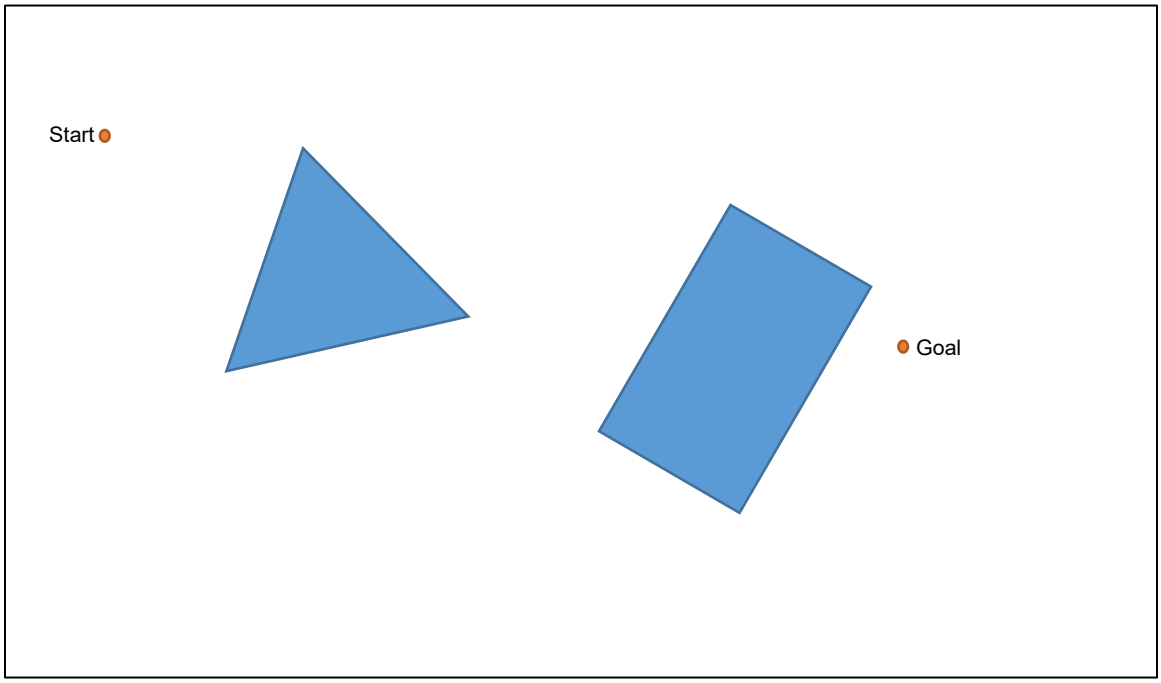
Problem 1: Consider the following 2D robot motion planning problem, which shows the start location and goal location of a robot, and a set of obstacles in Configuration Space (C-Space). Recall that the C-Space transform shrinks the robot to a single point with no size, and expands the obstacles to account for the dimensions of the robot. Note that the boundary are four walls of a room, and are thus obstacles as well.

a. Draw the Visibility Graph on the C-Space below.
b. Highlight in some way the path that would be taken if we used an optimal search algorithm (such as A* with an admissible heuristic) on this Visibility Graph.
c. Is that path the optimal solution to this robot motion planning problem? (Yes or No)



Problem 2: Consider the following 2D robot motion planning problem, which shows the start location and goal location of a robot, and a set of obstacles in Configuration Space (C-Space). Recall that the C-Space transform shrinks the robot to a single point with no size, and expands the obstacles to account for the dimensions of the robot. Note that the boundary are four walls of a room, and are thus obstacles as well.

a. Draw the Voronoi Diagram on the C-Space below. Do your best with this to approximate the Voronoi Diagram (I'm not expecting it to be perfect).
b. Highlight in some way the path that would be taken if we used an optimal search algorithm (such as A* with an admissible heuristic) on this Voronoi Diagram.
c. Is that path the optimal solution to this robot motion planning problem? (Yes or No)



Problem 3: Consider the following 2D robot motion planning problem, which shows the start location and goal location of a robot, and a set of obstacles in Configuration Space (C-Space). Recall that the C-Space transform shrinks the robot to a single point with no size, and expands the obstacles to account for the dimensions of the robot. Note that the boundary are four walls of a room, and are thus obstacles as well.

a. I've given you an approximate cell decomposition below (the red lines). Shade in all cells that your robot is not allowed to enter.
b. Indicate in some way the path that would be taken if we used an optimal search algorithm (such as A* with an admissible heuristic) on this cell decomposition. There are actually multiple correct answers to this—just show one of the possible paths that the search would find.
c. Is that path the optimal solution to this robot motion planning problem? (Yes or No)