AUTONOMOUS ROBOTICS

ACADIA UNIVERSITY DALHOUSIE UNIVERSITY *Inspiring Minds*

Introduction to Path-Planning and Navigation
Assignment #4
Due: Wednesday October 19, 2011

1. Write a MATLAB® script to determine whether or not a point robot in a 2D workspace, located at position (x, y), collides with an obstacle of the following form:
   (i) circular obstacle, parameterized by a center (x_1, y_1) and radius R.
   (ii) rectangular obstacle described by coordinates of the four corners (x_1, y_1); (x_2, y_1); (x_1, y_2); (x_2, y_2).
   (iii) triangular obstacle described by the three corners (x_1, y_1); (x_2, y_2); (x_3, y_3).

   Hint. What is the set of points in the plane that satisfy $ax + by + c \cdot 0$?

   [10 marks]

2. Write a MATLAB® script to predict the output of an ultrasonic array mounted on a point robot situated at (0, 0). The various obstacles are given by:

   (i). circle of radius 5 centered at (10, 10).
   (ii). rectangle given by (-10, -5); (-10, 5); (-5, 5); (-5, -5)
   (iii) circle of radius 6 centered at (0, -8).

   Plot the output for the cases of:
   (i) range is 3 units, range resolution is 0.25 and angular resolution is 5 degrees.
   (ii) range is 10 units, range resolution is 0.25 and angular resolution is 2.5 degrees.
   (iii) range is infinite, range resolution is 0.5 and angular resolution is 10 degrees.

   Hint. Use the saturated raw distance function. Do not assume pre-knowledge of obstacles by the robot.

   [20 marks]

3. Implement the Tangent Bug algorithm for a 2D point robot in a MATLAB® script. Produce robot trajectories in different scenarios for obstacles and goals.

   Hint: Use code from previous questions. Use rectangular and circular obstacles as primitives to build more complex scenarios.

   [30 marks]

Submit your zipped up solutions to mae.seto@dal.ca