Assignment 2
CSCI-4965/6963: Robot Motion Planning

Due: Monday, October 1, 2001, 11:59pm

Assignments are due at 11:59pm on October 1, and are to be done individually. Assignments will be graded on the basis of correctness, clarity, and code documentation. See the course syllabus for late submission policy.

In this programming assignment, you are to implement the visibility graph method to find shortest paths in a planar environment with convex polygonal obstacles. This assignment is intended to familiarize you with writing programs that involve geometric computations. Your code should be commented.

1. The input to your program will be a set of convex polygons representing the obstacles, and the initial configuration and goal configuration of a point robot. The program should return the shortest path as a sequence of vertices from the initial configuration to the goal configuration.

2. Implement the construction of the visibility graph for a point robot translating in the plane. You will need to create appropriate data structures to represent the initial and goal points, the polygons, the visibility edges, and the visibility graph.

3. You may assume all polygons are convex. Each polygon will be specified by its vertices in counterclockwise order. The vertex coordinates of the polygons will be in an input file. Each vertex will be specified by its x and y coordinates.

4. Assume the initial and goal configurations are not in the interior of any obstacle polygon.

5. You may implement the straightforward $O(n^3)$ algorithm to determine the visibility edges of the graph, or use the rotational sweep algorithm for a more efficient $O(n^2 \log n)$ implementation.

6. You can use Dijkstra's algorithm or any other search algorithm to find the shortest path from the initial configuration to the goal configuration.

7. Test your program on example cases.

8. It is recommended that you use C++ (or C) to write your program. Your program will be tested on the Solaris (UNIX) workstations in the computer labs in Amos Eaton 117 and Amos Eaton 217. You should provide a README file that describes how to compile and run your program.

Submission

The code must be submitted no later than 11:59 pm on October 1, 2001. **You are responsible for ensuring that your code can compile and run on the Sun Ultra10s in the OOT Lab (Amos Eaton 117) or in the Sparc Lab (Amos Eaton 217).**

You must hand in your source code (source and header files) along with a Makefile to compile it. Also include a README file with the following information: your name, email address, instructions on how to compile the code and run it, an overview of your implementation and search algorithm, known bugs or limitations, and any other relevant information.

Details of the submission procedure for your assignment will be posted on the course web-page. **Please check the course web page frequently for announcements and additional information on the assignment.**