

Assignment no. 1

due: March 23rd, 2009

Exercise 1.1 Write a program that reads a simple polygon P from a file, and then a sequence of query points from another file. For each query point q your program needs to determine whether q is in P . Do not use ready made procedures, but rather implement your own solution in full. The emphasis is on the robustness of the solution rather than its efficiency, and so you can implement a simple $O(n)$ solution for a polygon with n vertices.

Use machine `double` to represent coordinates. It would be advantageous to design your program generically so that in the future (not in this assignment) you can substitute `double` with other number types.

The polygon input file is a list of decimal numbers (all in the unit square) where each pair of numbers constitute the coordinates of a vertex of the polygon, the vertices appear in the file in their order along the polygon boundary, and the last vertex connects with an edge to the first vertex to close the polygon.

The query points file is a list of decimal numbers, where each consecutive pair constitute the coordinates of the query point.

Exercise 1.2 Design an extensive set of experiments to test your program. Query points should not be only randomly produced but rather include points on or near the boundary of the polygon and in particular points on or near vertices of the polygon.

Try to spot other possible inputs that may be non-trivial for the algorithm to handle (this may depend on the specific algorithm you choose to implement).

Summarize the behavior of your algorithm and explain the experimental observations.