Effective Computational Geometry
The Theory and Practice of Implementing Geometric Algorithms
Exercise 2

Lutz Kettner Kurt Mehlhorn Elmar Schömer

November 5, 2001

Exercise 1: (10 pts) Read the definitions of *polygonal chain*, *simple chain*, and *weakly simple chain* at the beginning of Section 10.8.1 of the LEDAbook.

1. Design an algorithm which decides whether a point p lies in the bounded region induced by a weakly simple chain: Hint: determine the number of intersection between a vertical upward ray starting at p and the chain. You may assume at first that p does not lie on the chain and that the ray does not pass through any vertex of the chain.

2. Free your solution from the assumption above.

Exercise 2: (10 pts) Design an algorithm which takes a polygonal chain and determines whether the chain is simple. Do the same for weak simplicity.

Exercise 3: (5 pts) In class, we discussed an algorithm to compute the intersection of two polygonal regions. Which changes are required to compute the symmetric difference?

Exercise 4: (10 pts) Describe an algorithm to compute the area of the bounded region defined by a weakly simple polygonal chain.

Exercise 5: (20 pts) A triangulation of a point set S is a partition of the convex hull of S into triangles. Design a sweep line algorithm for computing a triangulation of a point set S.

Solutions are due November 15th and will be collected in the lecture on November 15th. Solutions will be discussed in the tutorials of the week after.