COT5520 Computational Geometry

Homework Assignment # 2

Due: September 15, 2003

1. Change the code of Algorithm FindIntersections (and of the procedures that it calls) such that the working storage is $O(n)$ instead of $O(n+k)$.

2. Let *S* be a set of *n* triangles in the plane. The boundaries of the triangles are disjoint, but it is possible that a triangle lies completely inside another triangle. Let *P* be a set of *n* points in the plane. Give an $O(n \log n)$ algorithm that reports each point in *P* lying outside all triangles.

3. Suppose that a doubly connected edge list of a connected subdivision is given. Give pseudocode for an algorithm that lists all faces with vertices that appear on the outer boundary.

4. Let S be a set of N points in the plane with integer coordinates between 1 and N^d, where *d* is a constant. Show that the convex hull of S can be obtained in linear time.

5. Design an efficient algorithm to solve the following problem: Given *n* boy robots and *n* girl robots, whose positions are specified by points in the plane, such that the boy robots are separated from the girl robots by a vertical line. Find a matching of the boys with the girls by straight line-segments so that no two segments intersect. Intuitively, this corresponds to the paths the boys will have to make to pick a girl to go square dancing with. If more than one pair of boys and girls become collinear, their paths may have to overlap, but what will be a gentleman's etiquette to avoid collision? What is the complexity of your algorithm? (Hint: Use convex Hulls).