Assignment no. 4

given: May 26th, 2000
due: June 12th, 2000 (put in Eti Ezra's mailbox)

Exercise 4.1 (r) Implement and display graphically a solution to the following problems.

(a) Given a convex polygon P and a direction (slope) θ find a bisector of P with slope θ.

(b) Every pair of disjoint convex polygons have a unique simultaneous area bisector. Given two disjoint convex polygons find their simultaneous bisector.

(Optional) animate the solution, namely display intermediate steps of your algorithms.

Exercise 4.2

(a) We call a collection T of triangles in 3-space *sparse* if every triangle in T intersects at most some small constant number of other triangles in T. Give lower and upper bounds on the complexity of the *vertical decomposition* of a sparse collection of n triangles in 3-space.

(b) Describe the vertical decomposition of a collection of n spheres in 3-space.

Exercise 4.3 (r) (optional) Implement an $O(n^2)$-time (or near-quadratic time) algorithm to compute the smallest area triangle determined by 3 out of a given set of n points in the plane. *Hint:* the duality transform shown in class preserves the vertical distance between points and lines.