Assignment no. 4

due: May 26th, 2014

Exercise 4.1 Let P be a set of n points in the plane. Give an $O(n \log n)$ time algorithm to find for each point p in P another point in P that is closest to p.

Exercise 4.2 Do the breakpoints of the beach line in Fortune's algorithm always move downwards when the sweep line moves downwards? Prove this or give a counterexample.

Exercise 4.3(*) Give an efficient[1] algorithm to compute the *medial axis* of a convex polygon.

Exercise 4.4 Let L be a set of lines in the plane. Give an $O(n \log n)$ time algorithm to compute an axis-parallel rectangle that contains all the vertices of the arrangement $\mathcal{A}(L)$ in its interior.

Exercise 4.5 Let S be a set of n segments in the plane. A line ℓ that intersects all segments of S is called a *transversal* or *stabber* for S.
(a) Give an $O(n^2)$ algorithm to decide if a stabber exists for S.
(b) Now assume that all segments in S are vertical. Give an expected linear time algorithm to decide if a stabber for S exists.
(CGAA Ex. 8.16)

Exercise 4.6 Show that any two triangulations of a planar point set can be transformed into each other by edge flips. (Show first that any two triangulations of a convex polygon can be transformed into each other by edge flips.)

[1] An $O(n \log n)$-time algorithm will give you the full credit for this exercise.