CS/SE 6301.008 Homework 3

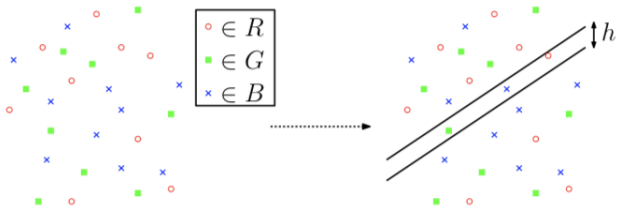
Due Thursday March 22nd at 11:30am, on eLearning

Please answer ~~both~~ question 2 only. You may form groups of up to three students. Each group should write a single set of solutions with each group member's name and Net ID on the front page. Each group member should then submit a copy through eLearning.

1. **(From Erickson[1])** **This question was harder than anticipated, so I am just giving everybody extra credit. You do not need to solve this problem.** ~~Suppose we are given the Voronoi diagram of a set P of n sites in the plane, but we are not given the set P itself. Describe an algorithm to reconstruct the site set P from its Voronoi diagram in $O(n)$ time. Assume that every Voronoi vertex has degree 3. If there is more than one point set consistent with the given diagram, just return one such set.~~

   [Hint: It may help to solve the following simpler problem first. Given a bounded Voronoi edge uv along with u and v's other incident edges, how can you find the four sites whose cells are incident to u or v in $O(1)$ time?]

2. **(From Mount)** You are given three sets of points R, G, and B (red, green, and blue) in $\mathbb{R}^2$. A tricolor strip is a pair of parallel lines such that the closed region bounded between these two lines contains exactly three points, one from each of R, G, and B. Define the strip's height to be the vertical distance between these lines.



(From Mount). Tricolor strip of height h.

   (a) Explain what a tricolor strip of height h corresponds to in the dual plane.

   (b) If a tricolor strip is of minimum height, what additional conditions must be satisfied? Explain briefly.

   (c) Present an algorithm, which given inputs R, G, and B, computes the minimum height tricolor strip. Your algorithm should run in time $O(n^2 \log n)$, where $n = |R| + |G| + |B|$.

[1] http://jeffe.cs.illinois.edu/teaching/compgeom/hw,etc./hw1.pdf