

CS 499 (Fall 2006)- Assignment 9

Due: Thursday, 11/16/2006

- (1) Here, you are asked to use the Voronoi Diagram to efficiently answer nearest neighbor queries. Identify some types of landmarks for which you want to actually determine nearest neighbors of points. Lots of such data is available, for instance, at <http://geonames.usgs.gov/> (follow “Domestic Names” and use the “Search” function — it allows you to store the results in a file with easy-to-process format.) You can find locations of schools, post offices, and lots of other things there. Pick any one that you personally are interested in. If you prefer, you can use a different data source if you have one, or find one using Google.

Using the Divide&Conquer algorithm we discussed in class, compute the Voronoi diagram with all necessary information for your data, and from that, compute the search structure with iteratively finer triangles. The total computation should preferably run in $O(n \log n)$ time. The search structure, together with the correct labels for the lowest level triangles, should be stored in a file somewhere in a convenient format.

In addition, you should write a separate program (presumably short and simple), which uses your stored data structure to efficiently (in $O(\log n)$ time) find the closest neighbor for each given query, and report its name and description. You are free to decide what to do if there are multiple equally close closest neighbors.

Since the Voronoi Diagram algorithm is somewhat complex, and not in the recommended textbook, I suggest you check out for instance the nice description at <http://www.personal.kent.edu/~rmuhamma/Compgeometry/MyCG/Voronoi/DivConqVor/divConqVor.htm>. This assignment will likely be a little longer again (hence two weeks to complete it), so you may want to start somewhat early.