MA/CSSE 473 – Design and Analysis of Algorithms

Homework 8 (50 points total) Quickhull (50 points)

(Summer: Drop Box) These are to be turned in as hard copy. You can write solutions out by hand, or write them on your computer and print them. If there are multiple pages, please staple them together.

When a problem is given by number, it is from the textbook. 1.1.2 means "problem 2 from section 1.1" .

Problems for enlightenment/practice/review (not to turn in, but you should think about them):

How many of them you need to do serious work on depends on you and your background. I do not want to make everyone do one of them for the sake of the (possibly) few who need it. You can hopefully figure out which ones you need to do.

5.1.5	(insertion sort sentinel)
5.1.10	(Shell's sort) This should be review from 230
5.2.2	(adjacency matrix *vs* adjacency list for DFS)
5.2.7	(Use BFS/DFS to find a graph's connected components)
5.2.10	(DFS and mazes)
5.3.1	(Topological sort examples)
5.3.2	(Theoretical properties of topological sort)
5.3.9	(Strongly connected components)

Problems to write up and turn in:

1. (5) 5.1.1 (Ferrying Soldiers)
2. (5) 5.1.3 (generate power set)
3. (5) 5.1.9 (binary insertion sort efficiency) get big-theta for the number of comparisons and the number of moves.
4. (6) 5.2.3 (independence of properties from specific DFS traversals) Explain your answers.
5. (10) 5.2.8a (Bipartite graph checking using DFS)
6. (9) 5.3.6 (finding dag sources) Be sure to do all three parts.
7. (10) 5.3.10 (Celebrity identification)

Quickhull implementation problem (50 points): (Summer: Finish it by about the 60% mark in the weeks you expect to spend on this course).

Same problem as the "brute force" convex hull problem. But this time use the QuickHull algorithm to find the convex hull. The kinds of things you should submit are basically the same as before. Include a comparison of running times for brute force and quickhull on various input sizes.