22C : 196 Computational Geometry
Homework 6

The exercise numbers correspond to the electronic version of the text available from our library.

1. Exercise 8.2 (1 point)
2. Exercise 8.8 (1 point)
3. Exercise 8.15 (2 points)
4. Exercise 8.16 (2 points)
5. Exercise 10.2 (2 points)
6. Exercise 10.7(a) (1 point)
7. Exercise 10.10 (1 point)

The following question helps appreciate why interval trees can be conceptually useful. You won't get any homework credit for solving it.

1. We are given a set $\mathcal{R} = \{R_1, R_2, \ldots, R_n\}$ of n (axes-parallel) rectangles in the plane. A subset $\mathcal{R}' \subseteq \mathcal{R}$ is said to be *independent* if no two rectangles in $\mathcal{R}'$ intersect. (Note that two rectangles can intersect even if their boundaries don't.) Our goal is to find an independent set of maximum cardinality, but we'll settle for the weaker goal of a polynomial time algorithm that returns an independent set with cardinality that is at least $c/\log n$ times that of the maximum, for some constant $c > 0$.

   (a) Argue that for the special case where is a vertical line ℓ that intersects all the input rectangles, there is a polynomial time algorithm for computing the maximum cardinality independent set.

   (b) For the general case, use an interval tree and the algorithm for the special case to achieve the weaker goal.

The homework is to be turned in into the dropbox *Homework6* on ICON. I would prefer if you type in the text, but hand-drawn figures are okay. The homework is due by 11:59 pm on Tuesday May 7th.

On the question of collaboration and seeking help, I recommend thinking about each problem for 15–30 minutes first (not counting time spent getting familiar with basic material covered in class). You may collaborate with classmates after that, but definitely avoid looking at completely written solutions of others. Explain the final solution in your own words, and do not turn in a solution that you don't understand.