# CISC-868 FALL 2011

HOMEWORK 9

Please read chapter 8 of Mark de Berg, Otfried Cheong, Marc van Kreveld, and Mark Overmars Computational Geometry:Algorithms and Applications. You can obtain this chapter online for free from the Queen's University Library QCAT, or from the authors at http://www.cs.uu.nl/geobook/

**Exercise 8.3:** Use Euler's formula to show that the maximum number of faces is $n^2/2 + n/2 + 1$ for an arrangement with $n(n-1)/2$ vertices and $n^2$ edges.

**Exercise 8.6:** Let $S$ be a set of $n$ points in the plane and let $L$ be a set of $m$ lines in the plane. Suppose we wish to determine whether there is a point in $S$ that lies on a line in $L$. What is the dual of this problem?

**Exercise 8.13:** Given a set $L$ of $n$ lines in the plane, give an $O(n \log n)$ time algorithm to compute the maximum level of any vertex in the arrangement $\mathcal{A}(L)$.

**Exercise 8.14:** Let $S$ be a set of $n$ points in the plane. Give an $O(n^2)$ time algorithm to find the line containing the maximum number of points in $S$.

**Biggest slope:** Given a set of $n$ points in the plane, no three on the same line, find a pair that yields a line with the largest slope. This should be easy to do in $O(n^2)$ time. Can you come up with an $O(n \log n)$ algorithm?

**Right-most point in an arrangement:** Given a set of $n$ lines $L$ no two parallel and no three intersecting at the same point, find a right-most vertex in the arrangement $\mathcal{A}(L)$ in $O(n \log n)$ time.