

# Homework 7 - Percolation

Thursday 19 October, 2006 - Due: Thursday 26 October

While working on Lab 7, you may have wondered why we were plotting the fraction of sites in the largest cluster as opposed to the fraction of sites in the spanning cluster—the cluster that extends across the system. The fraction of sites in the spanning cluster is the order parameter of the percolation transition as discussed in class. Please modify the percolation code for the square lattice to determine whether or not the largest cluster is spanning or not and print out the fraction of sites of in the spanning cluster as a function of  $p$  for three different system lengths. How does these plots differ from the fraction of sites in the largest cluster plots (for the same  $L$ )?

Hint: There are several ways to determine whether or not the largest cluster is spanning. One could define two one-dimensional arrays of length  $L$  and initialize all entries to zero. Then loop through the sites in the largest cluster. If one site takes up the  $x = 0$ , then one of the one-dimensional arrays, say  $x(0)$ , goes from 0 to 1. After looping through the sites, if the largest cluster is spanning in the  $x$  direction, then the sum of the entries of  $x(j)$  should be equal to  $L$ . To determine which sites are in the largest cluster, the array `ptr[i]` is organized in the following way: any positive entry points to the root of the cluster, any negative entry that is larger than `-EMPTY` denotes the size of the cluster, and any entry equal to `-EMPTY` means that the site is unoccupied.

Note: If you are having “problems” with the assignment do not hesitate to e-mail me at [jschwarz@physics.syr.edu](mailto:jschwarz@physics.syr.edu) or call me at 607-342-0876.