PROBLEM SET 6   Due Friday March 1
Physics 140A– WINTER 2013

Analytic:

[**1.**] Compute and plot the entropy S of a two level system with $E_1/k_B = 2.3°K$ and $E_2/k_B = 4.0°K$. Use the formula $F = \langle E \rangle - TS$ where the free energy $F = -T \ln Z$. Interpret the high and low T limits. What will S be for a nineteen level system at $T = \infty$?

[**2.**] Sidebottom 11-1.

[**3.**] Sidebottom 11-3.

Numeric:

[**4.**] Finish your disk program by measuring the correlation function $g(r)$. What I did was to go through all the pairs of disks and bin the separation between their centers $|\vec{r}_1 - \vec{r}_2|$. There are a couple of things which help get better data:

You have a loop where you jiggle the disk positions many times. Don't just measure $g(r)$ once at the end, but rather quite a few times during the update process.

Use periodic boundary conditions (as discussed in class): Make eight copies of your box of disks (see Figure) and include distances between disks in the copies as well as your 'real' disks.

Don't forget to divide $g(r)$ by $2\pi r$ to account for the trivial 'phase space' fact that there is more room for atoms at larger r.
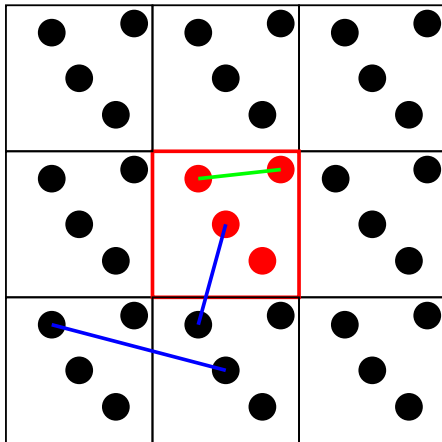
Using eight pbc boxes will help give you better data for $g(r)$. Include separations shown by the interbox (blue) lines as well as the intrabox (green) lines.

Red = real simulation box
 Black = eight pbc boxes