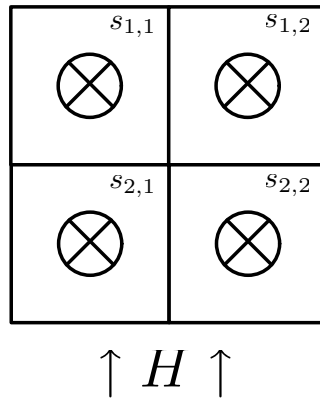


Problem Set #5
Due on Tuesday, 27 May 2008

Principle of Maximum Entropy for a Spin System (75 pts)

Consider a system of four particles interacting with each other and interacting with an external field as shown below.



The energy of this system is given by:

$$E = -\epsilon \sum_{\text{neighbors}} s_{i,j} s_{i+1,j+1} - H \sum_{i,j} s_{i,j}$$

where s_k can be $+1$ or -1 representing the spin state of the particle in site- k , and $\epsilon = 1\text{J}$, $H = 2\text{J}$. An observer measures the average energy of such a system to be $\langle E \rangle = -2\text{J}$.

- How many different states can we have for such a system?
- Find the probability distribution of the states?
- What is the temperature of the system, $T = ?$
- Increase the temperature of the system found in part c) by doubling it ($T' = 2T$.) Find the new probability distribution.