Computing a correlation function

0.1 Level 1

The segments of the wheel on the right indicate the values of 100 non-interacting spins in a magnetic field. The degree of correlation between two spins that are separated by r lattice sites is measured using $\delta(r) = \frac{\sum_{i=1}^{N}(s_i - \langle s \rangle)(s_{i+r} - \langle s \rangle)}{\sum_{i=1}^{N}(s_i - \langle s \rangle)^2}$ where $\langle s \rangle$ is the average spin for the system. Use the blocks provided to calculate the degree of correlation between the spins that are two lattice sites appart. Once you have calcualted this quantity print it to screen using the print correlation block.

0.2 Level 2

Now calculate the degree of correlation between the spins that are two lattice sites appart in this first configuration. Then generate a new configuration using the generate microstate block and recalculate the correlation. Output the average of the correlation between the spins that are two lattice sites appart for the two configurations you generated using the print correlation block. Remember that the degree of correlation between two spins that are separated by r lattice sites is measured using $\delta(r) = \frac{\sum_{i=1}^{N}(s_i - \langle s \rangle)(s_{i+r} - \langle s \rangle)}{\sum_{i=1}^{N}(s_i - \langle s \rangle)^2}$ N.B. To test if your code is correct the browser will calculate the correleation function for the initial microstate that was generated and the correlation function for the microstate that is loaded when the print correlation function block is executed. The mean for these two microstate is then compared with the mean that you print using the print correlation function block.

0.3 Level 3

Now calculate and plot a graph that shows r on the x-axis and that on the y axis shows the degree of correlation between the spins that are r lattice sites appart. You should do this for a single configuration only. Remember that the degree of correlation between two spins that are separated by r lattice sites is measured using $\delta(r) = \frac{\sum_{i=1}^{N}(s_i - \langle s \rangle)(s_{i+r} - \langle s \rangle)}{\sum_{i=1}^{N}(s_i - \langle s \rangle)^2}$