Parallelising Spin Models on Different Geometries

Filip Sosnowski

July 15, 2021

1 Abstract

2 Introduction

The Ising model is mathematical model used to study the properties of a thermodynamic system. Named after Ernst Ising, it is one of the most important models of statistical mechanics as it helps us to study phase transitions. These phase transitions describe the transition of a system into a different state of matter. Classically, the Ising model deals with the ferromagnetic properties of a system, showing how a system's magnetic properties change with temperature.

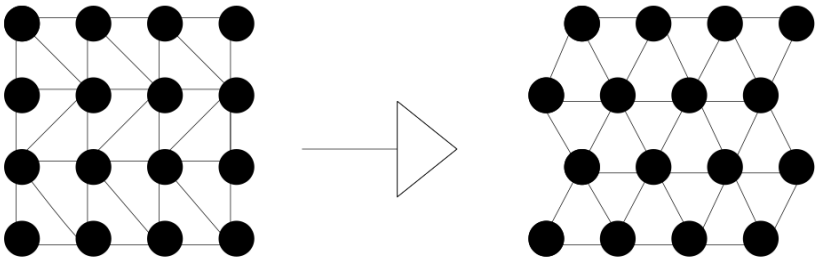
In the Ising model the system is comprised of "particles" arranged in a lattice. These particles are then represented by their "spins", which can be either +1 or -1.

3 Procedure

3.1 Serial Ising Grid Model

3.2 Parallelising the Ising Model

4 Triangular Ising Model



To find the nearest neighbours in the triangular Ising model I drew the triangular lattice first then mapped it to a normal square grid. From this I was able to deduce the nearest neigbours. As can be seen, each particle on the

lattice has six neighbours, the four same ones as on the 2-D square grid and two additional ones. These two additional neighbours differ for even and odd rows, going forwards for even rows and backwards for odd rows. This gives the following neighbours:

g[i-1][j]
g[i+1][j]
g[i][j-1]
g[i][j+1]
g[i+1][j+(-1)^i]
g[i-1][j+(-1)^i]

5 Results