

Cellular Automata The Game of Life

The Game of Life is an iterative process set up on a square grid. Cells on the grid are either “alive” or “dead”. If a cell is “dead” and has exactly 3 neighbors, it has enough resources to be born without being overcrowded, and the next turn will be “alive”. If a cell is alive and has 3 or 4 neighbors, it has resources without being overcrowded and will stay “alive”. If a cell has 2 or fewer neighbors, it cannot get enough resources to survive and the next turn will be “dead”. If a cell has more than 4 neighbors, it will be overcrowded and the next turn will be dead.

A typical progression might look like:

Turn 1

			X
	X		
	X		
	X		

Turn 2

X	X	X	

Turn 3

	X		
	X		
	X		

These simple rules can lead to many complicated phenomena, some of which seem quite stable, and some of which seem almost chaotic.

Running the Game of Life on a large scale can require a lot of memory. The amount of storage scales as the side length of your grid squared.

This problem is ripe for exploitation by parallel programming. You could break up a larger grid into smaller subgrids. Since each cell only needs information about its nearest neighbors, you only have to communicate among subgrids at the edges of the subgrids.

The MPI Life example is set up to run as “side by side” subgrids. You enter in the number of rows and columns of each subgrid, and the number of iterations to be solved.