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Project Proposal: ParLife

## Parallel Implementation of Cellular Automata

Implement a parallelized version of Conway's Game of Life<sup>1</sup> utilizing parallelization to compute each subsection of the game board simultaneously. Conway's Game of Life is an example of a cellular automata<sup>2</sup> which is a discrete model of computation representing computation by a grid of cells each in one of a finite set of states. For each clock tick the next state of the grid is determined by the start state and the rules governing each cell's state transition.

Cellular automata lends itself well to parallelization as the grid can be divided into sections and each such section can be computed in parallel. One possible risk would be computing the state of the edges of each section, where multiple sections influence one another. One approach to address this challenge would be to compute the state of each section in parallel independently and then compute the state of any section which would be influenced by the previously computed section.

The goal of this project is to implement Conway's Game of Life accurately and also to improve performance such that the number of iterations it is possible to run in a given amount of time is greatly increased. We will use the number of iterations / T where T is time as a metric to measure the success of our parallelization.