Conway’s Game of life Assignment 1 Commentary

Cocurrent System 159.355

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Conway’s Game of Life and Complex systems

Over the last couple weeks I have enjoyed my experience implementing parallel solutions to Conway’s Game of Life, however I have more so appreciated the glimpse I have had into the world of complex systems.

The study of complex systems investigates how relationships between parts give rise to the collective behaviours of a system, and examples of this can be seen everywhere. Birds flying in a flock for instance are a complex system and each bird in that system follows a specific set of rules, these are 1. Stay close to nearby birds but don’t hit them. 2. Fly as fast as the birds nearby. 3. Move towards the center of the group. It is therefore easy to see the similarities between this example and Conway’s Game of Life. It is also easy to see how these systems that are based off rules can translate well into digital simulations.

Studying how the Game of Life works can help us understand other practical applications of complex systems as well. For instance in my example I have the cells on the perimeter all set to 1 and when it runs it morphs into many symmetrical patterns. However, if I introduced just a single 1 cell near the edge of that parameter then the whole system would become chaotic and asymmetric. This is “the butterfly effect” in action. A small change now can make a huge difference down the line. This is why predicting weather (which in many ways is itself a complex system) becomes significantly more difficult as time progresses.

It is not a coincidence that the scientific field of complex systems came about after computers became able to properly simulate these systems. Computers have a large part to play in unravelling their mysteries, and the results of doing so could have huge beneficial implications on our world and the way we live.

Just to Note: I have found many interesting resources about complex systems online but the below TED talk i found particularly interesting and at times quite funny.
https://www.youtube.com/watch?v=mOheTsPx220

Parallelism

While progressing through this assignment and paper I have come to not only see some of the potential that parallel computing has to offer, but also the contexts in which such an approach is useful.

The brain for instance shows us the potential of what parallel computation could possibly achieve in the future. While not quite a computer in the regular sense, the brain does solve problems in a parallel fashion, and it gains a few remarkable traits because of this. For one it is extremely energy efficient. It can calculate a similar amount of bits per second as the Blue Gene supercomputer, but using one hundred thousand times less energy. Also, because information is transferred simultaneously in pieces it is highly robust and it has redundancies in place to insure successful transfers. These are just a couple possibilities for the future of parallel computers.

Over the last couple months however I have come to the conclusion that Parallel computing is not a silver bullet for every single problem and in fact it is more effective depending on the problem. Even in my own Game of Life implementations I noticed that there were setups and resources that were best off being controlled by a single process. If I did however try and share the overhead with the other processes I would find that the action of splitting and reassembling the problem took more time than doing the problem itself. It seems to me that not every problem is suitable for parallelizing and deciding what to parallelize is the real difficulty.