Generative Art with Cellular Automata

One of the most popular examples of a cellular automaton is Conway's 'Game of Life', which involves a grid of cells starting at an initial state and developing through 'generations', by applying a set of rules to the entire system. While 'Game of Life' can generate interesting patterns, cellular automata can employ surprisingly simple sets of rules to simulate complex biological patterns and chemical systems, where a cell in a grid could now mimic a cell within an organism.

Generative art refers to art which has been created by a typically non-human system, which may take some sort of algorithmic approach to producing a piece of art, and can rely on human defined parameters or randomness. The aim of the project would be to create a system which can generate visual patterns making the use of cellular automata, allowing user interaction to influence its evolution over time. By combining generative art with cellular automata, there is a lot of space for experimentation with parameters to generate intricate and unpredictable designs which are aesthetically pleasing to users, yet internally consistent and engineered through computer science principles. Technologies such as Processing and p5.js are popular for creating generative art today.

The overall motivation for the project is to explore the intersection between computer science and art through producing a system as described above. The project has room to extend beyond cellular automata and combine multiple models, for instance reaction diffusion models, which can model chemical reactions / particle diffusion, but more significantly "Turing patterns", which again resemble intricate patterns in nature, generated through a framework involving rules and interactions. Evaluating the final system would potentially involve feedback from an expert within a preferable field (an intersection between art and computer science), as well as feedback from a number of non-expert users, in an attempt to provide some sense of objectivity into evaluating the art produced, as well as the user experience with the system.

References

- Cellular automaton - https://en.wikipedia.org/wiki/Cellular_automaton
- Conway's 'Game of Life' - https://en.wikipedia.org/wiki/Conway%27s_Game_of_Life
- Exemplar art - 'rock-paper-scissors Cellular Automaton' - https://github.com/Gugubo/Rock-Paper-Scissor-Cellular-Automaton
- Exemplar art - Karl Sims, 'Seven Experiments in Procedural Animation' - https://www.karlsims.com/seven.html
- Paper / Exemplar art - Gary R Greenfield, 'Minimalist art from cellular automata' - https://www.tandfonline.com/doi/full/10.1080/17513472.2020.1730547?needAccess=true
- Processing - https://processing.org/
- p5.js - https://p5js.org/
- Turing patterns - https://en.wikipedia.org/wiki/Turing_pattern