Variations on the Theme of Life

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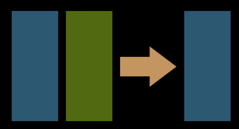
Cellular Automata

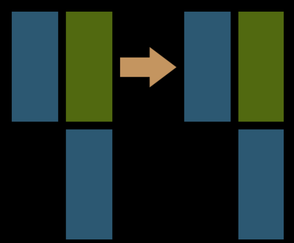
A cellular automaton is a mathematical model based around a rectangular grid of cells, each of which can be in one of two states: *live* or *dead*. In 1970, John Conway popularized a specific version that he referred to as the *Game of Life*.

Conway's 'game' gave each cell on the grid a specific set of rules:

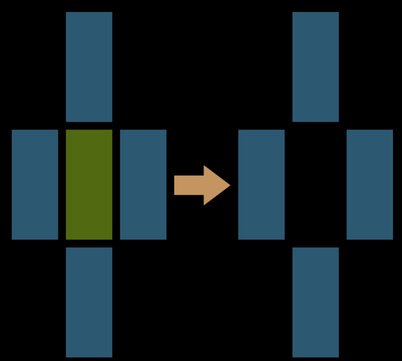
1. Any live cell with fewer than two live neighbors dies



2. Any live cell with two or three live neighbors lives



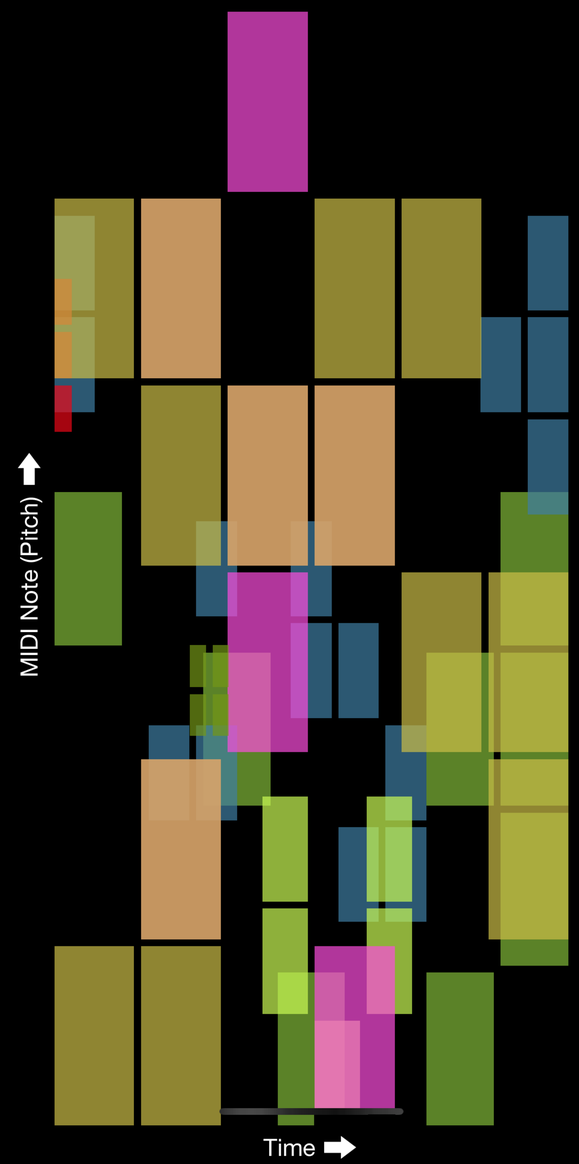
3. Any live cell with more than three live neighbors dies



4. Any dead cell with exactly three live neighbors becomes alive

Of course, those examples aren't entirely accurate — *all* the cells would be following those rules, not just the one.

Nonetheless, the rules aren't at all complex. In spite of this, some truly beautiful (and complex) patterns and behaviors can arise.



Within the app, several iterations of the Game of Life run at once, with each grid having its own color randomly assigned. This image portrays eight different grids, though some are the same size: Pink and beige are different grids, though the same size.

Users can tap the screen to move through a cycle of the Game of Life, or swipe down to start over with a fresh set of grids.

Audio Synthesis

Each iteration of the Game of Life is linked to a synthesizer. The visual properties of the grid create the auditory properties of the synthesizer: hue determines waveform, saturation the envelope, and so on.

Note Choice

The grids determine which notes their respective synthesizers will play. The time determines the column; the state of the cells within each column determines the note. So, for example, at the very beginning, the frontmost synthesizer will play a high note, one towards the back will play a low note, and one in the middle will play a pair of medium-high notes.

Chord Choice

One of the grids plays a special role: determining which chord to play. This is not just a matter of a single column, but a combination of a single column and the grid as a whole; the soundscape responds to the 'landscape' of that game of life.

With the chord chosen, each grid's options are limited; rather than alter the flow of the Game of Life, however, this alteration happens between the grid and the synthesizers.

Variation

One of the grids (or more, depending on how the grids are generated) is able to move more freely; rather than being limited to a specific chord, it is limited only to staying within the same key as the rest of the piece. Including these non-chord tones allows for more variety in the structure.

Generation

When the application is opened, or when the user swipes down on the screen to reset to a clean slate, the system randomly generates a new set of grids. Their size and color are randomly selected; that information is then used to create the synthesizers that each will be connected to. The grid that controls the chord is not connected to a synthesizer; the choice of chord seemed sufficient responsibility for one Game of Life.

References

This project is based on the work of John Conway, first published in *Scientific American* in October 1970.