decimal Game of Life

Mathieu

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1. Rule

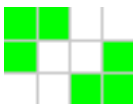
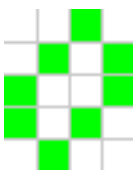
The universe of the decimal Game of Life is an infinite, two-dimensional orthogonal grid of square cells, each of which can be in one of ten possible states: 0, 1, 2, ..., 8, 9 (from dead to alive, or from low to high population). Every cell interacts with its eight neighbours, which are the cells that are horizontally, vertically, or diagonally adjacent. At each step in time, the following transitions occur:

1. Calculate the sum s of all its neighbours and the cell itself.
2. Any cell with $s \notin [10, 20]$ is set to zero (dies due to over- or underpopulation).
3. Any other cell survives and is set to the last digit of the sum, i.e., $s \bmod 10$.

The initial pattern constitutes the seed of the system. The first generation is created by applying the above rules simultaneously to every cell in the seed, whether alive or dead; births and deaths occur simultaneously. The rules are then applied repeatedly to create further generations.

2. Simple Patterns

2.1. Period 1

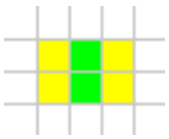
Image	Numbers	Data
	5500 5005 0055	103,5,203,5,202,5,1,5,100,5, 0,5
	050 505 050	102,5,201,5,100,5,1,5
	050 505 505 050	1,5,301,5,202,5,102,5,100,5, 200,5
	0550 5005 5050 0500	200,5,100,5,1,5,2,5,103,5, 202,5,301,5
	0050 0505 5005 5050 0500	401,5,302,5,203,5,103,5,2,5, 101,5,200,5,300,5

Live example: https://derbohrman.github.io/decimal-Game-of-Life/index.html

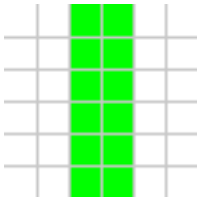
2.2. Period 2

Image	Numbers	Data
	5 5 5	200,5,100,5,0,5
	5550 0555	103,5,101,5,102,5,2,5,1,5, 0,5
	040 151 040	102,1,100,1,201,4,101,5,1,4
	030 252 030	1,3,201,3,100,2,101,5,102,2
	090 101 090	102,1,1,9,100,1,201,9
	090 101 909 010	202,9,102,1,1,9,100,1,200,9, 301,1
	080 202 080	102,2,1,8,100,2,201,8
	080 202 808 020	202,8,102,2,1,8,100,2,200,8, 301,2
	070 303 070	1,7,201,7,100,3,102,3
	070 303 707 030	1,7,202,7,102,3,100,3,200,7, 301,3
	060 404 060	102,4,1,6,100,4,201,6
	060 404 606 040	202,6,102,4,1,6,100,4,200,6, 301,4

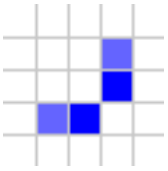
2.3. Period 3

Image	Numbers	Data
	353 353 353	2,3,1,5,0,3,100,3,101,5,102,3

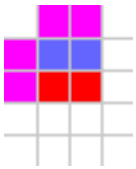
2.4. Period 4

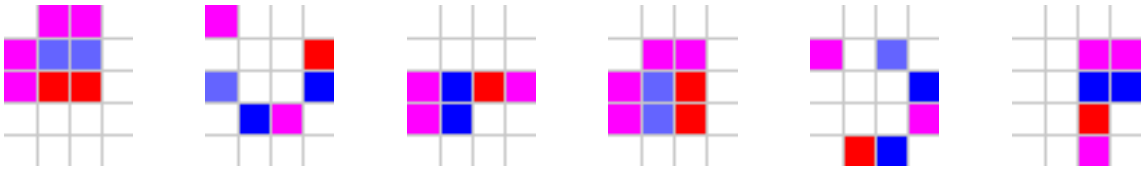
Image	Numbers	Data
	55 55 55 55 55 55	400,5,300,5,200,5,100,5,0,5, 1,5,101,5,201,5,301,5,401,5, 501,5,500,5

2.5. Period 8

Image	Numbers	Data
	008 004 840	200,8,201,4,102,4,2,8

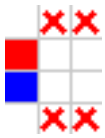
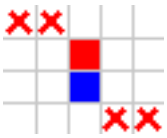
3. Glider

Image	Numbers	Data
	022 288 266	100,2,101,8,1,2,2,2,102,8, 202,6,201,6,200,2



4. Composite Patterns

This works for all structures with alternating cells that add up to 10. The red cross denotes the location where a neighbouring piece must be placed.

Image	Numbers	Data
	0XX 600 400 0XX	100,4,0,6
	XX000 00600 00400 000XX	100,4,0,6

Only for cells with fives:

Image	Numbers	Data
	XX000XX 0050500 0050500 0005000	201,5,100,5,0,5,102,5,2,5