Cellular Automata

Creating Complex Patterns from Simple Rules

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Introduction

What is the Cellular Automata?

Cellular Automata (CA) is a method of generating complex patterns from a discrete computational model defined by 8 rules.

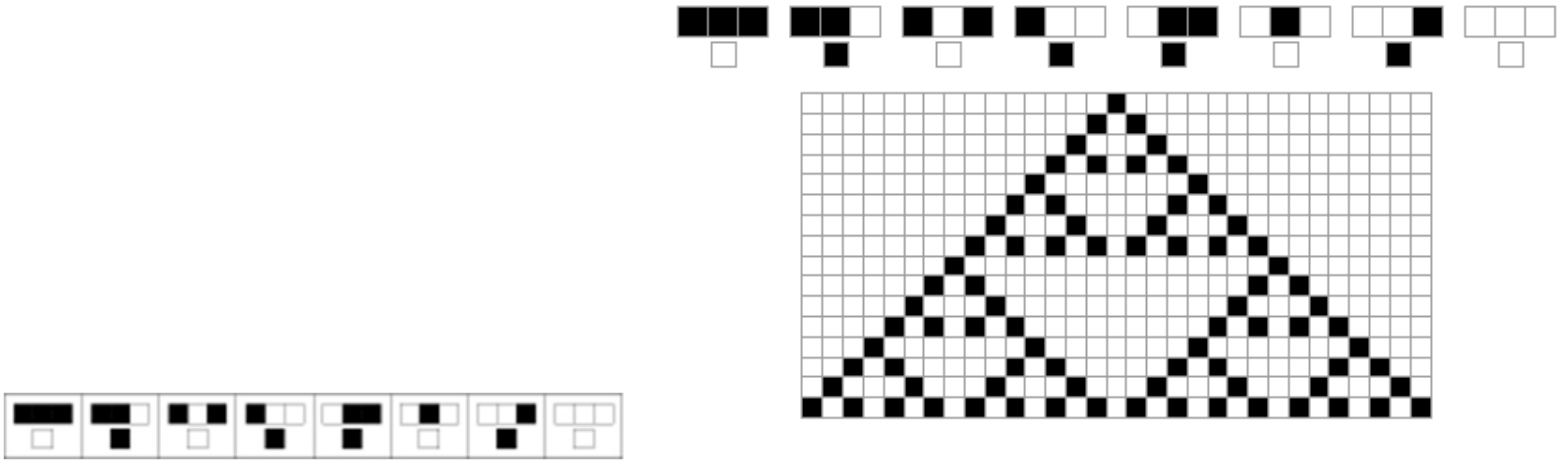
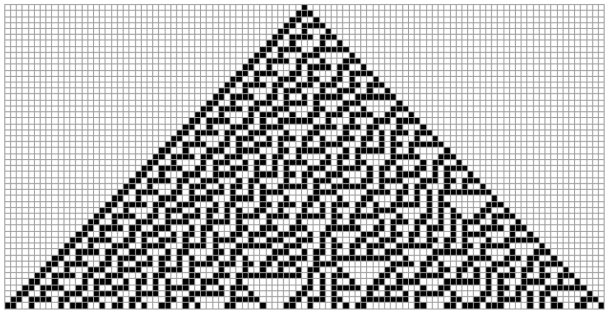
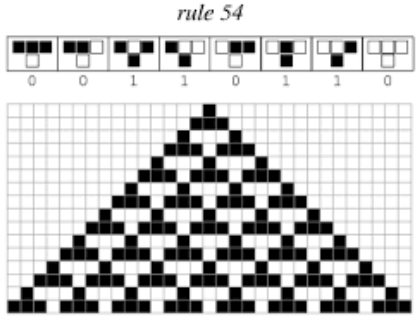


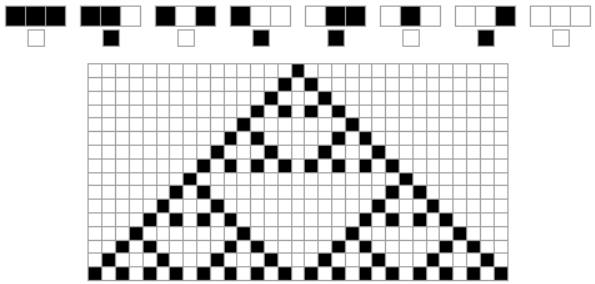
Figure: The rule set (left) for generating Rule 90 (right)

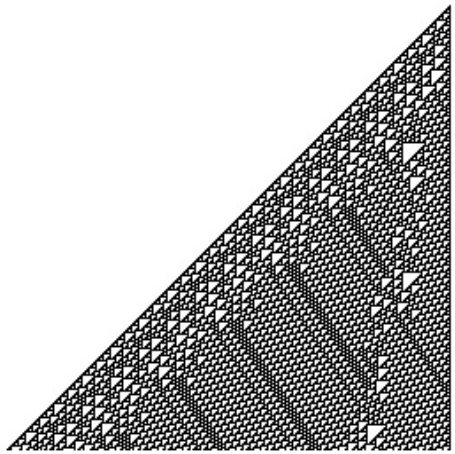
Theory

There are 256 patterns that can be generated by manipulating the rules. Below are a couple examples.









Methods

1.Excel

2. Look up table (extract from a bin)

3. Function

X[i,j] = (rule/(2**(4*X[i-1,j-1] + 2*X[i-1,j] + X[i-1,j+1])))

Conclusions

Cellular Automata is a quick way to visualize complex patterns by implementing simple, reiterated rules that are based off of neighboring phenomena.
This has been appreciated in nature as well.

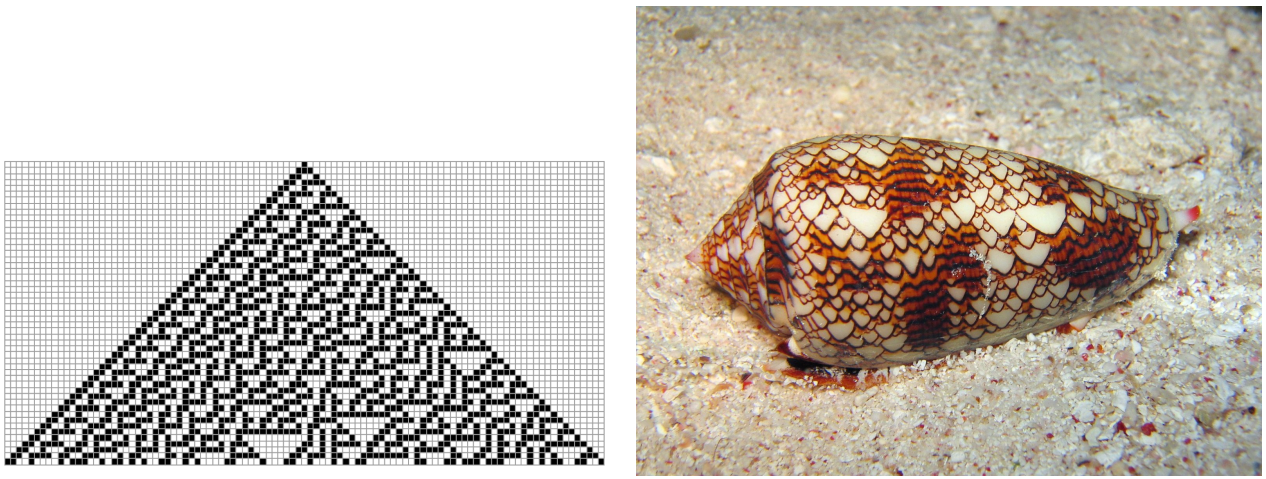


Figure: Sea shell exhibiting a pattern strikingly similar to Rule 30.