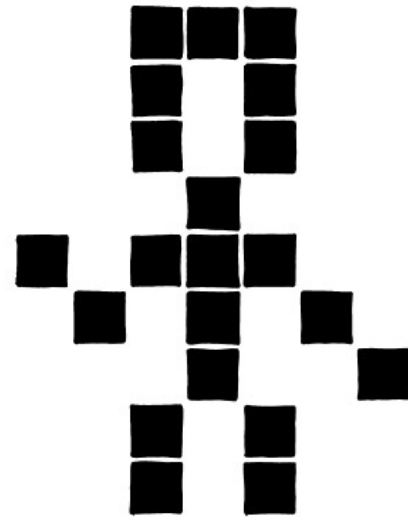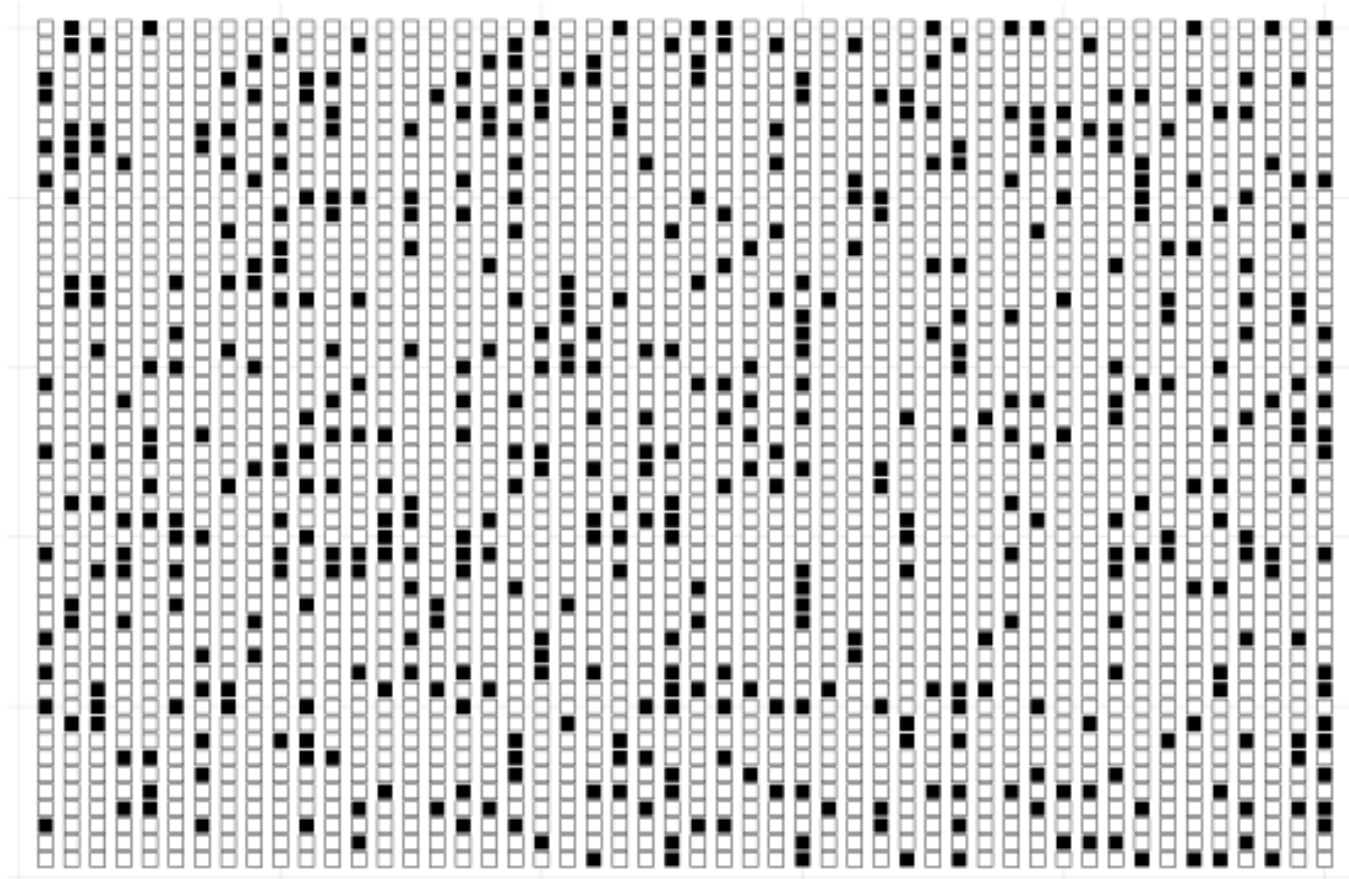# Cellular automata (CA) and their application

Produced by a "LETI" student
Dmitriy Shishkov gr. 1181

Conway's game of life

Elementary cellular automaton
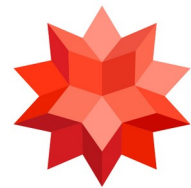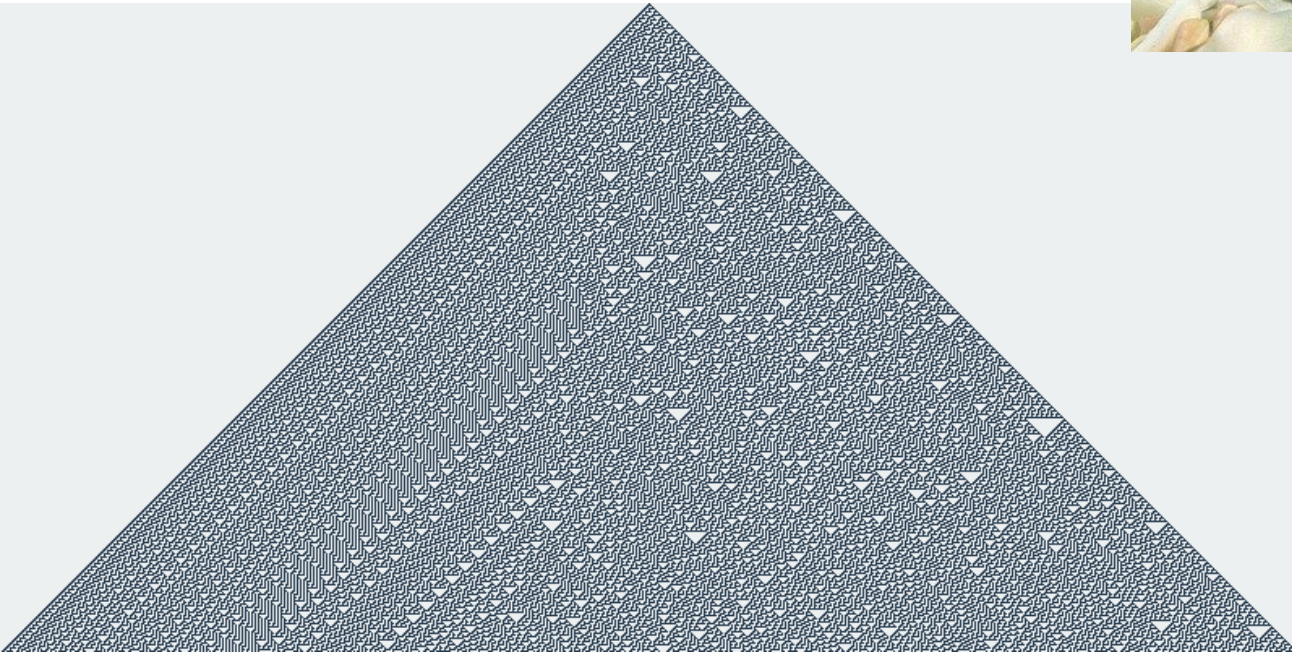
current automaton contents

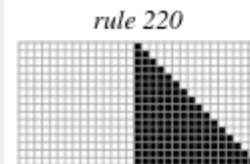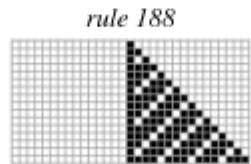rule 30 (00011110)

the next generation of the automaton

Rule 30
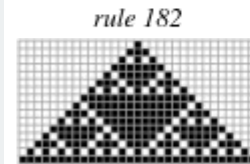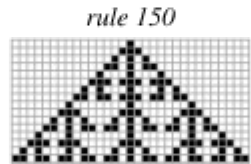
Pseudo-fractal generation

Rule 22

rule 102   rule 110

rule 126   rule 150

rule 182   rule 188

rule 220   rule 222
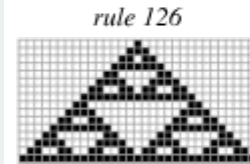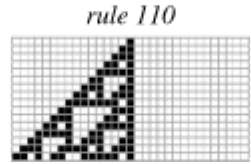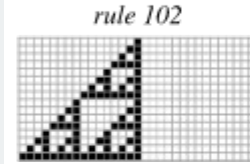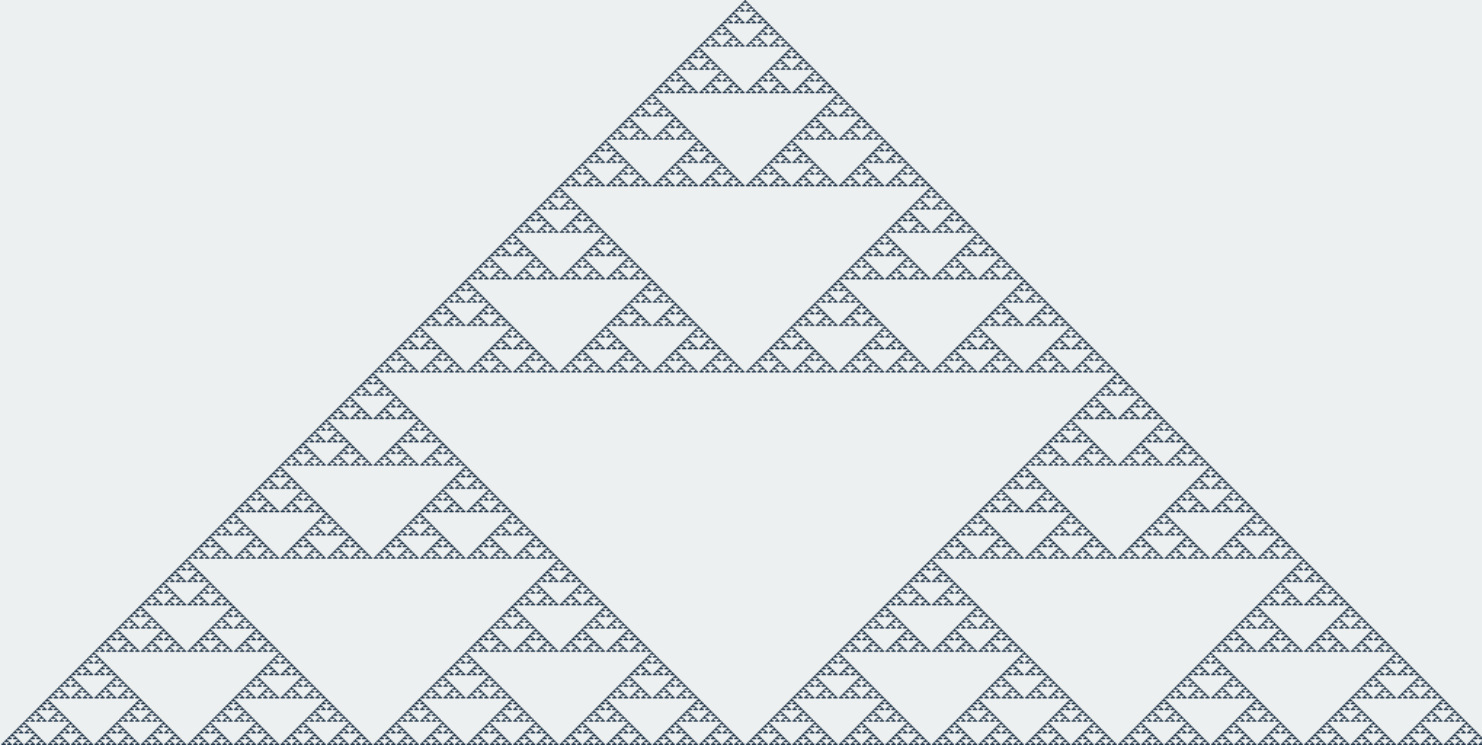
Rule 110

Turing complete

··· | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | ···
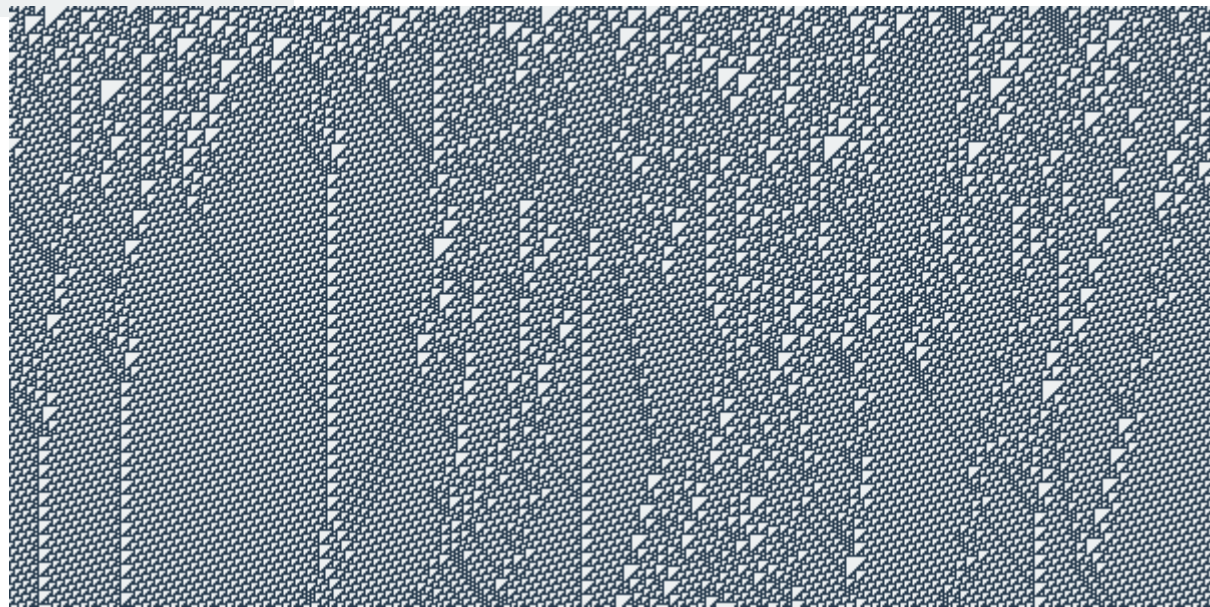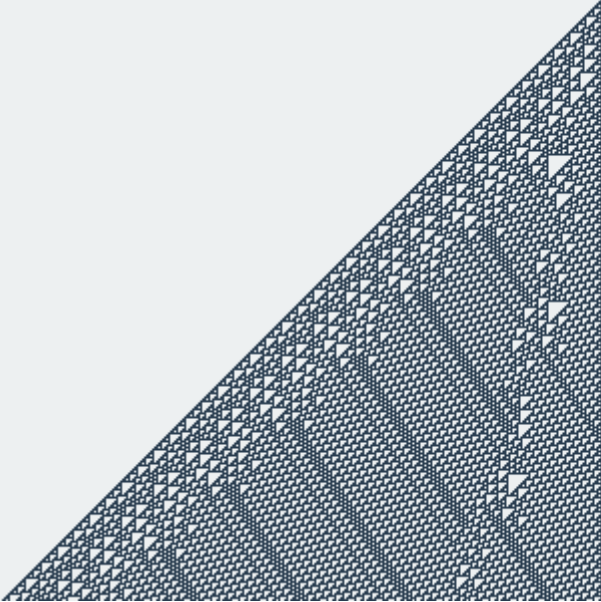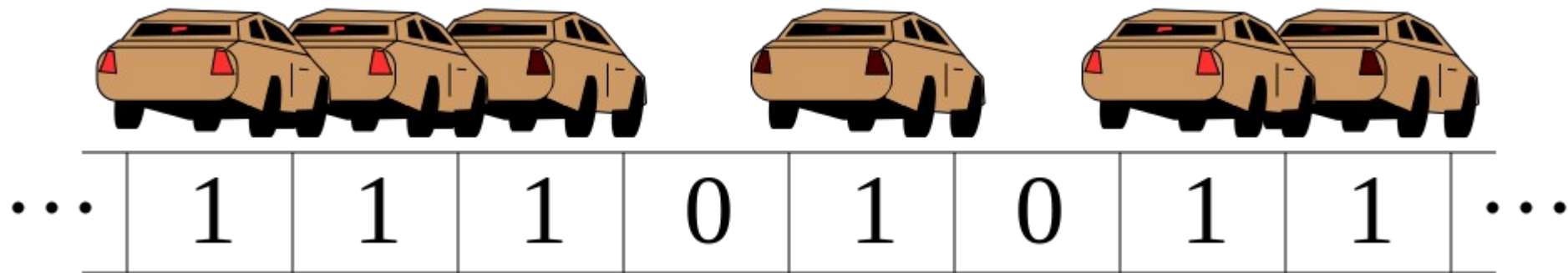
Rule 184

Wolfram Physics Project | Visual Summary

Rule (example)

$\{\{x, y\}, \{x, z\}\} \rightarrow \{\{x, z\}, \{x, w\}, \{y, w\}, \{z, w\}\}$

Rule defines transformations for collections of abstract elements

Sequence of updating events

initial condition

Spatial hypergraph

Space and matter are emergent features of the hypergraph

Elementary particles are localized persistent structures in the hypergraph

Multiway states+causal graph

initial condition

multiway branches

updating event

causal connections

branchlike hypersurface

10^{400} *steps*

Our universe (?)

Branchial graph

Connections are entanglements between quantum states

Branchial graphs define quantum superpositions

Multiway states graph

Multiway causal graph

Spacetime causal graph

timelike hypersurface

spacelike hypersurface

Energy is flux of causal edges through spacelike hypersurfaces

Momentum is flux of causal edges through timelike hypersurfaces

Thanks for your attention

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