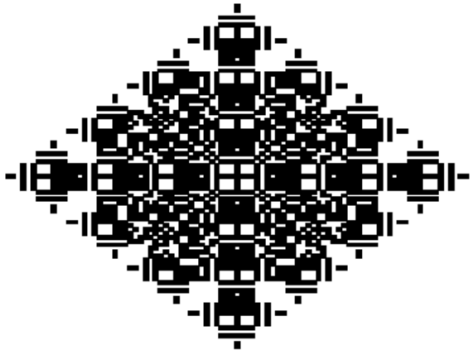
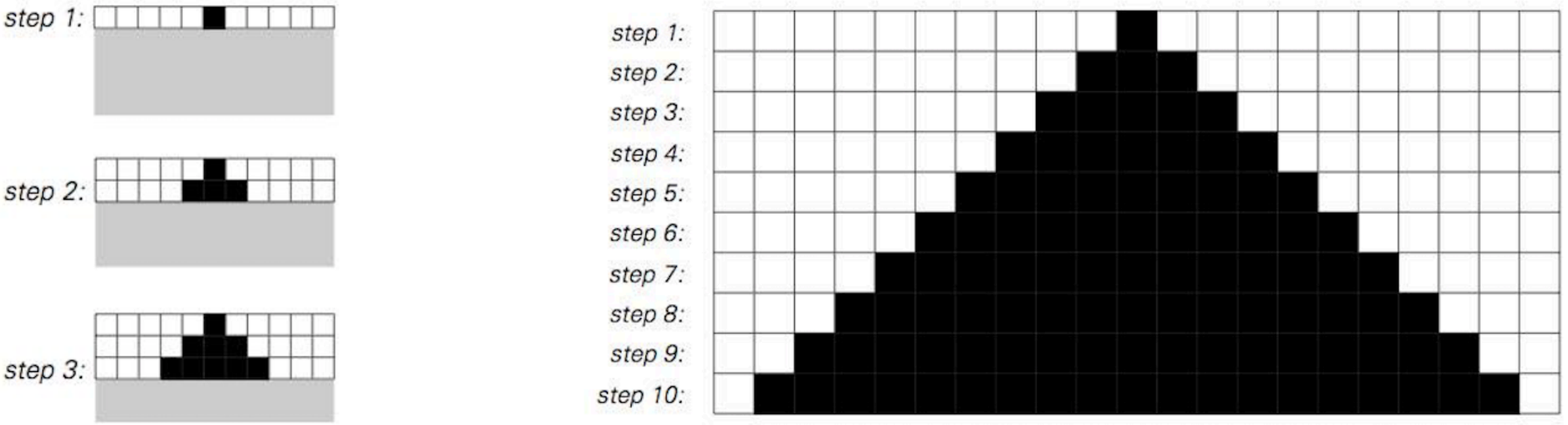
INSTITUT POLYTECHNIQUE DE PARIS

Cellular Automaton – Two dimensions and Beyond



Louis Caldas & Guillaume Barthe

Cellular Automaton –1-dimension model



Visual representation of the behavior of a cellular automaton

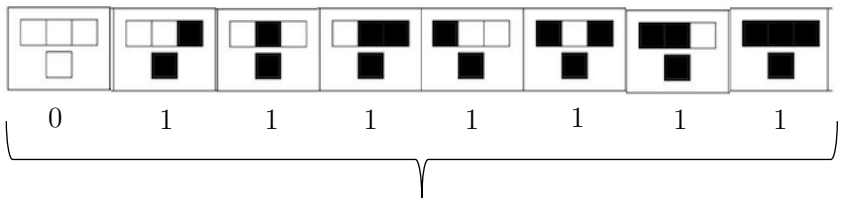
Each row corresponds to one step and at the first step, the **center-cell is black.**

On each **successive step**, a cell becomes black if one of her neighbor is black

Cellular Automaton –Neighborhood impact

Rules

Definite rule that determines the color of a given cell regarding the color of that cell and its neighbors

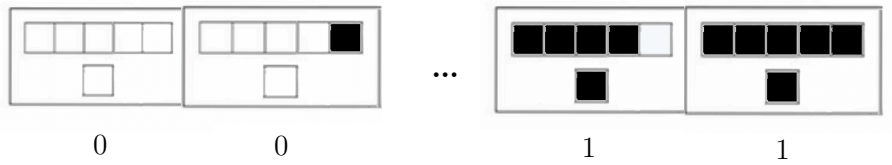


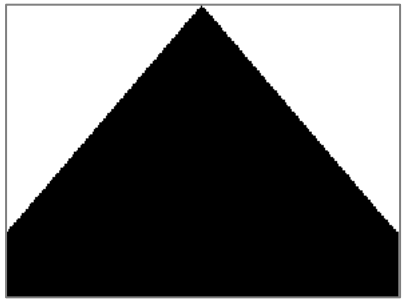
Rule 255

Augment the Neighborhood

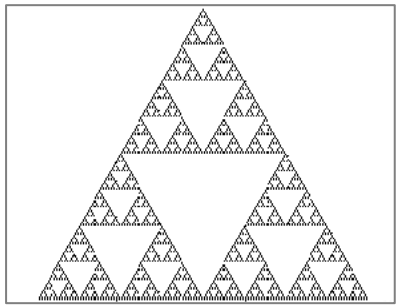
Look at **further neighbors.** Here we look at two neighbors in each direction

$2^5\ config$ → $2^{32}\ rules$

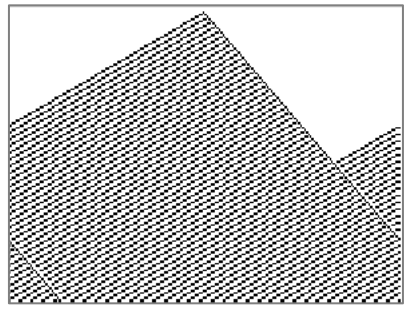




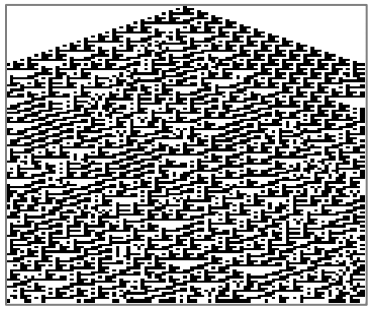
*rule 255 on 201*201 grid*



*rule 90 on 301*301 grid*



*rule 2830 on 201*201 grid*

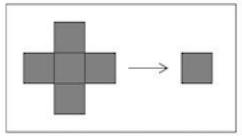


*rule 43742682 on 51*51 grid*

Cellular Automaton – 2-dimension model

Updated Rules

Update the color of a cell according to a rule that depends on its neighbors **in all four directions**



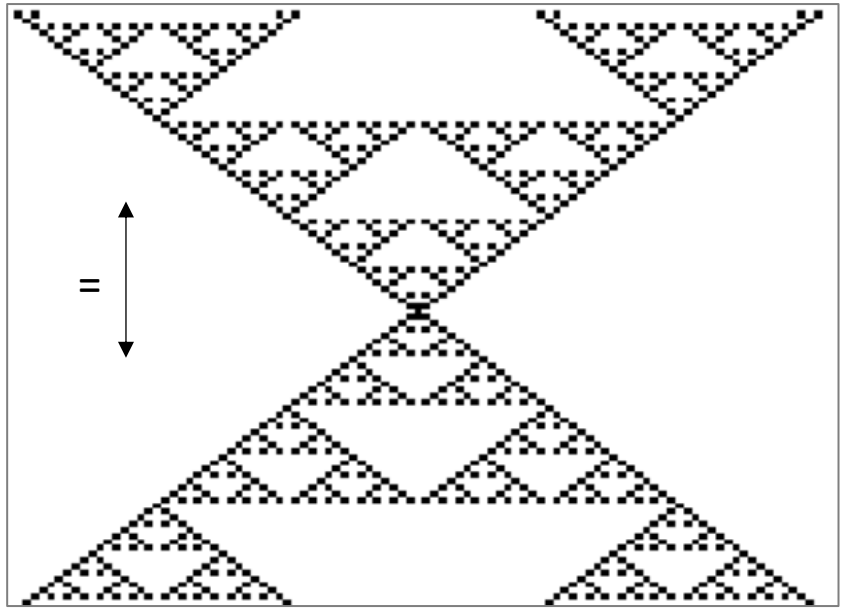
Too many configs → *New ruling system*

To decide on which color to put, look at the **number of neighbors around** but not their position

Rule [1 , 3 , 2] →

1 black-neighbor :
3 black-neighbor :
2 black-neighbor :

2D – Mirror calculation

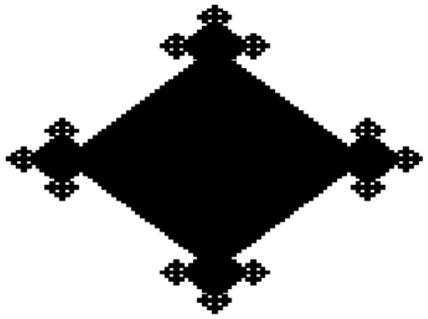


First experiment of 2d line-iterative calculation

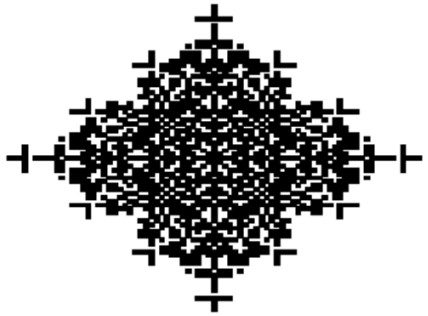
Cellular Automaton – 2-dimension model

Updated Method

Compute the **whole grid** at each step
and update each cell

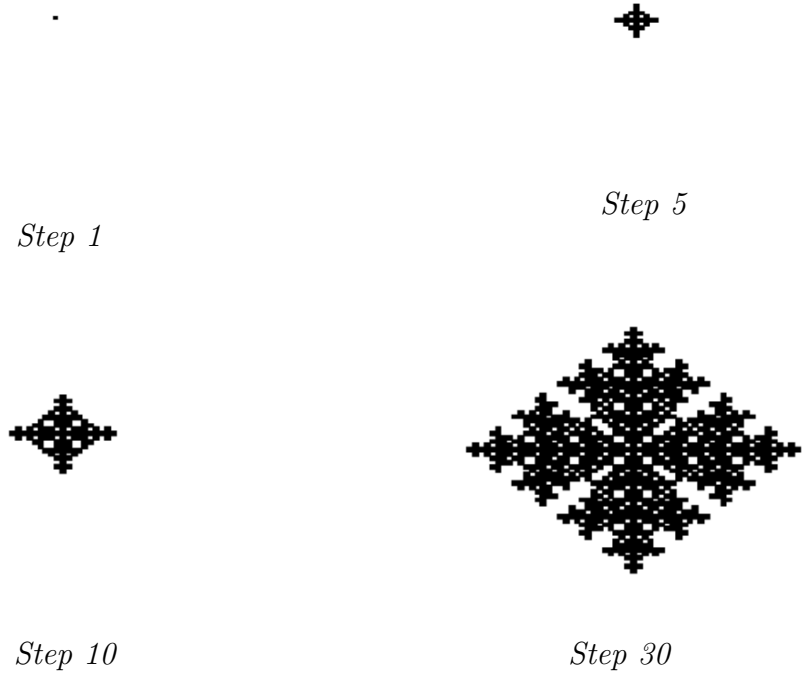


rule [1,4] with a 1-neighborhood



rule [1,4] with a 3-neighborhood

StepbyStep Method



Step 1

Step 5

Step 10

Step 30