

Understanding the transmission of information during Morphogenesis using CAs

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Context

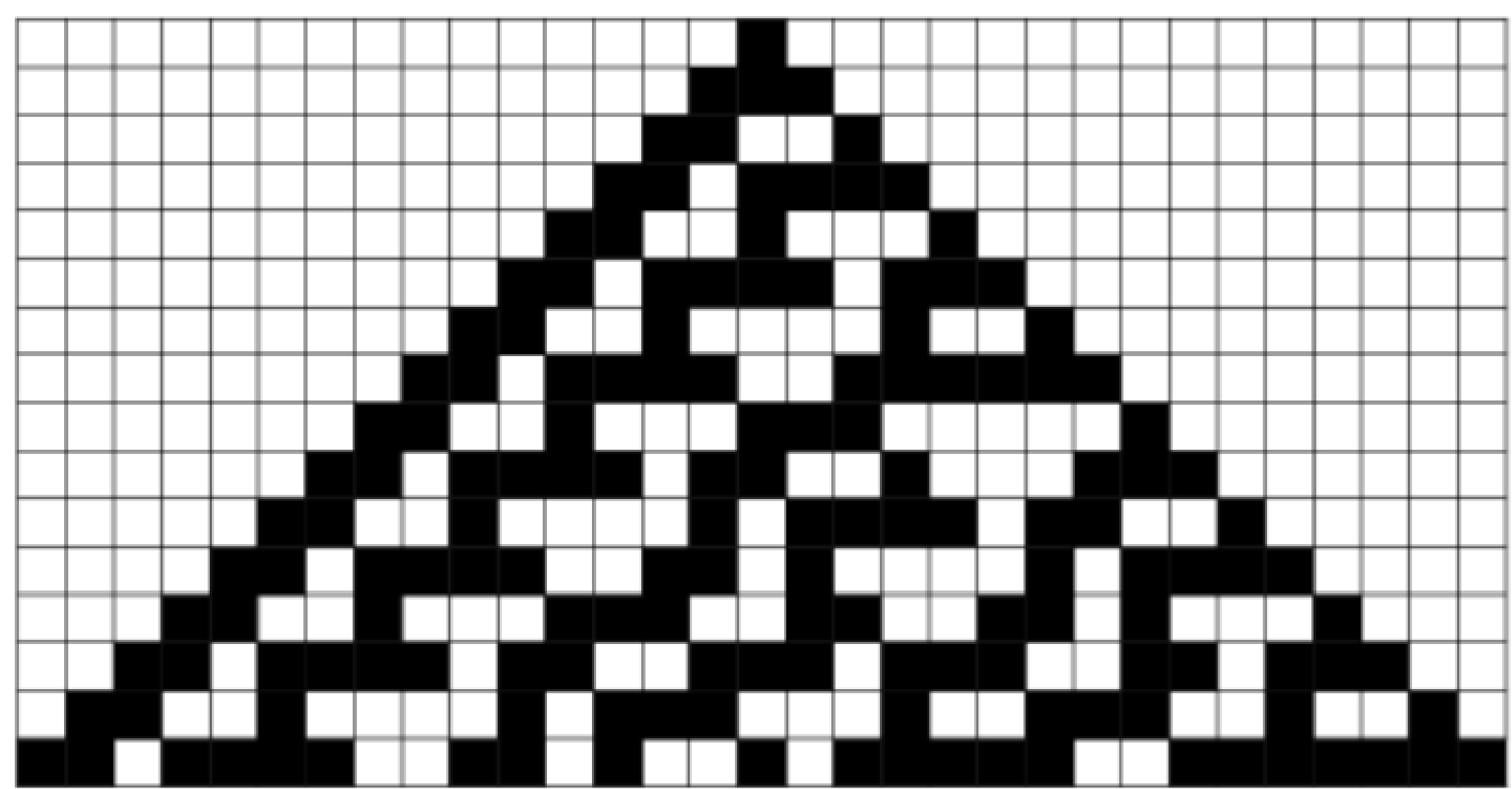
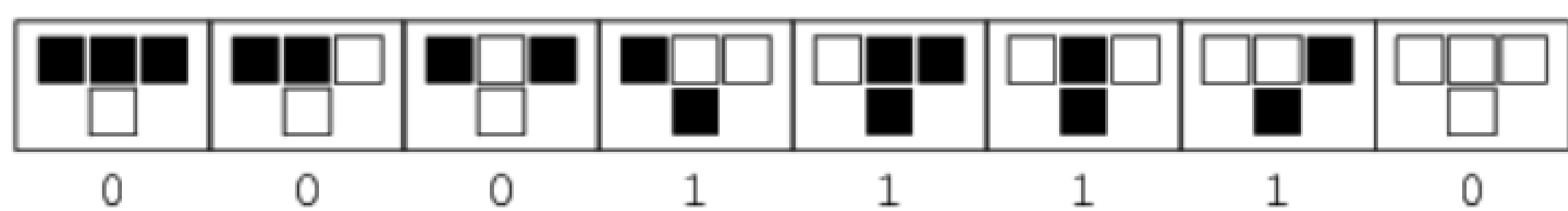
- Phenomenon of interest: **Morphogenesis**.
- Process of developing a body from a single cell.
- Cells communicate only locally.
- How information is transmitted during it?

Methodology

- Simulate the phenomenon of Morphogenesis using 2-dimensional **Cellular Automata (CA)**.
- Choose the rules for the CA by using **Genetic Programming (GP)**.
- Analyze a fully evolved CA that is capable of replicating an image.

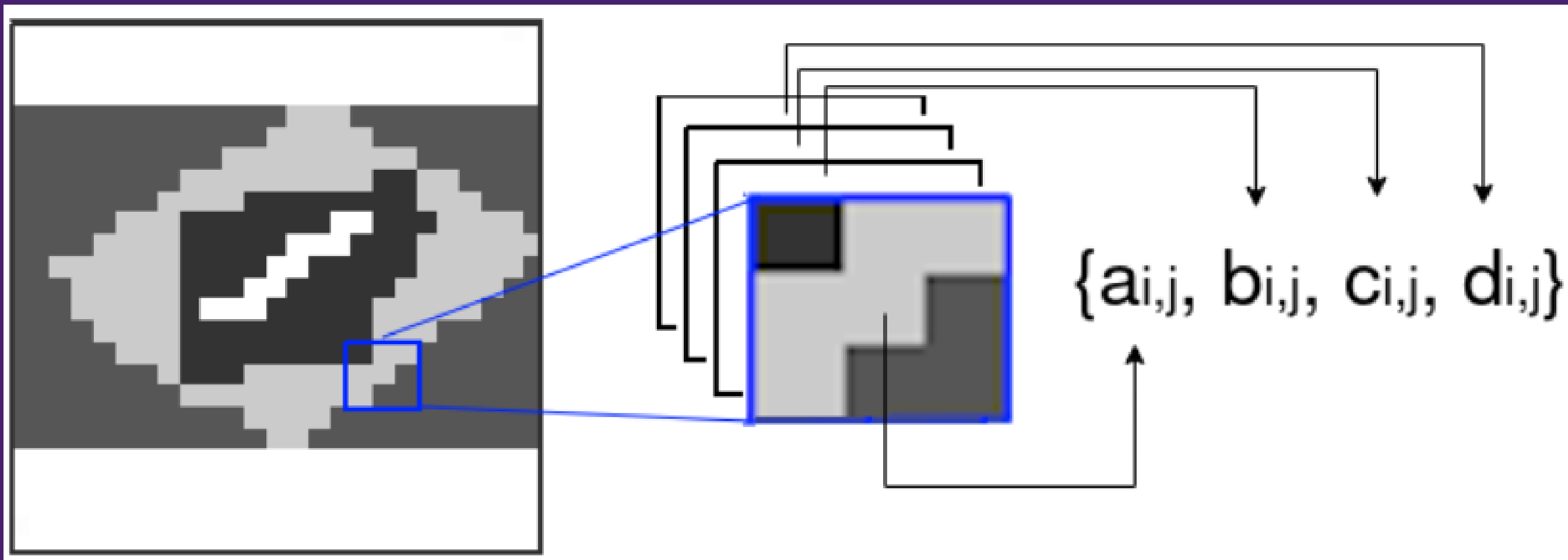
Example of CA: Elementar CA

rule 30

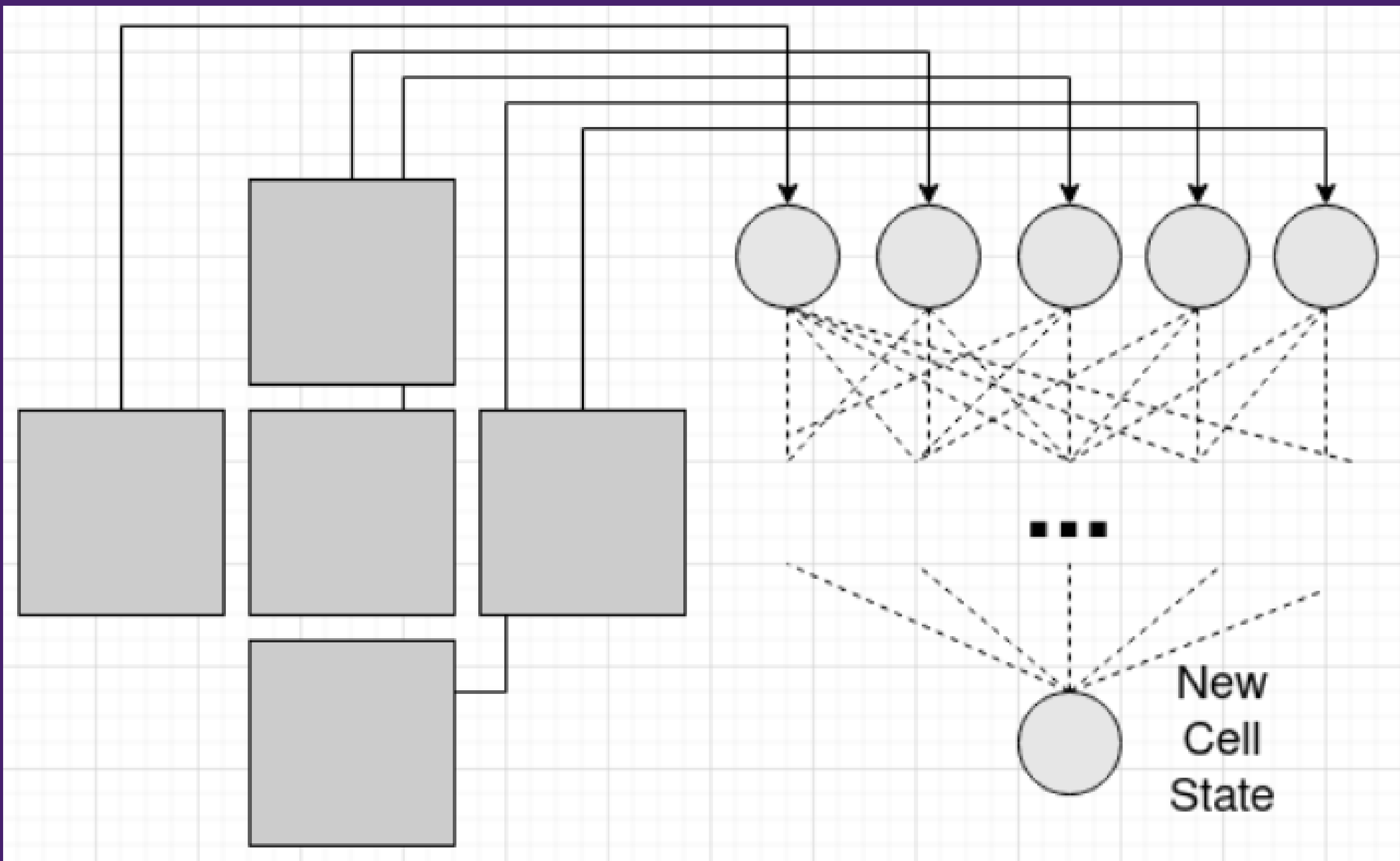


“Cellular Automaton.”From MathWorld, Weisstein, Eric W.

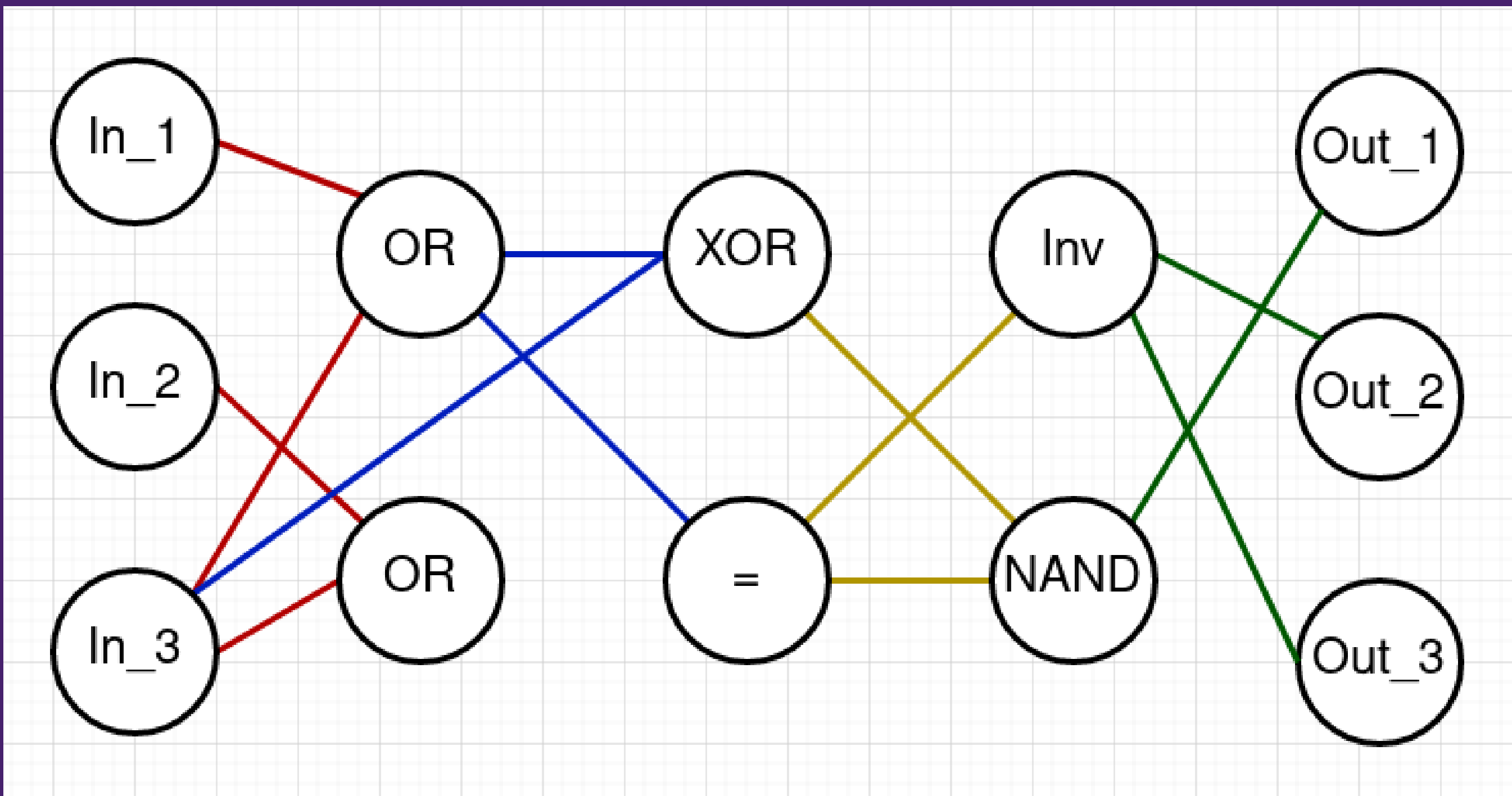
How My CA Works



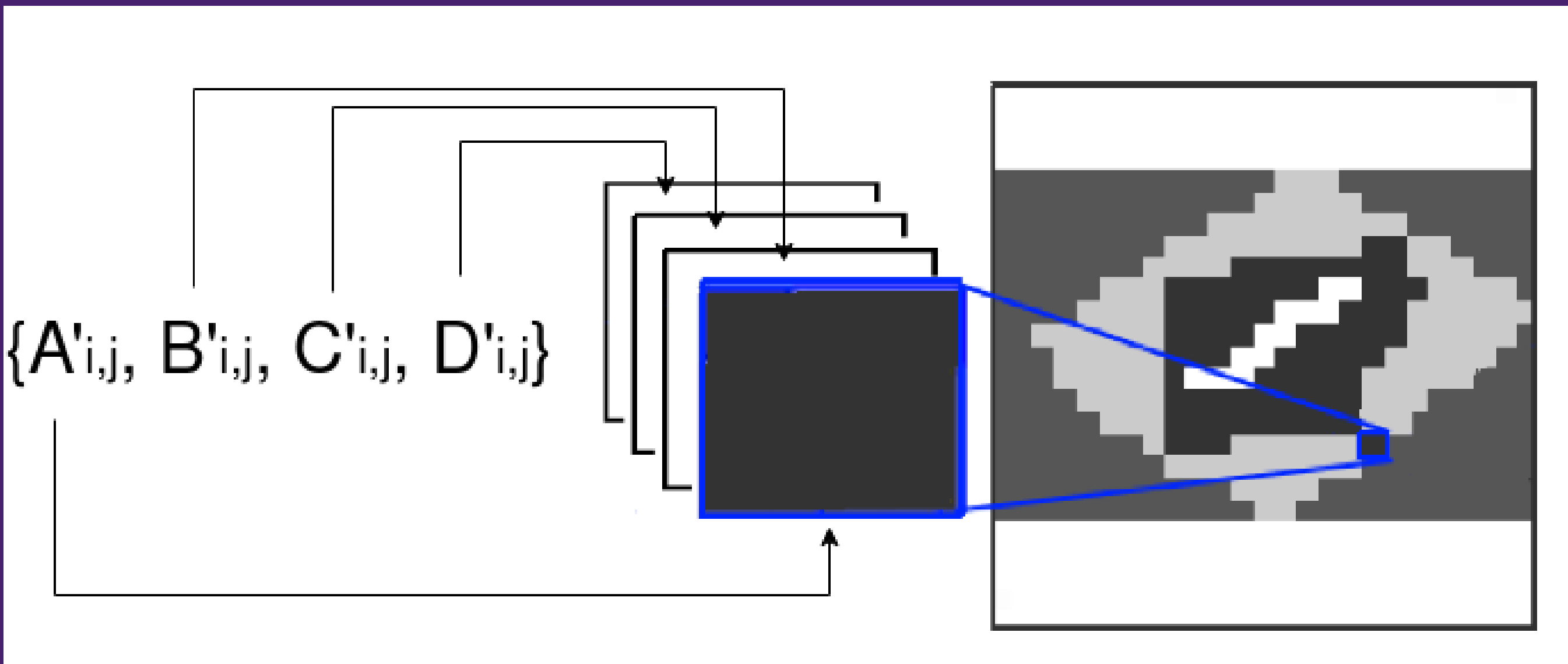
Get the state of a cell and its neighborhood



Pass these values through the rule system



In this case, the rules system is a **Cartesian GP graph**



Get the results and update the image

Current Results

In this experiments I am trying to evolve a CA to replicate some images. Below you can see the results, the figures on the left are the targets and the ones on the right are what the CAs developed



Questions

- Does the CA need an extra channel for communication?
- How complex is the transmission of information?
- How the CA communicates where to grow next and when to stop?

