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# Cellular Automata

## A brief Intruduction

Fabrice Beaumont

Rheinische Friedrich-Wilhelms-Universität Bonn

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# WHAT are Cellular Automata?

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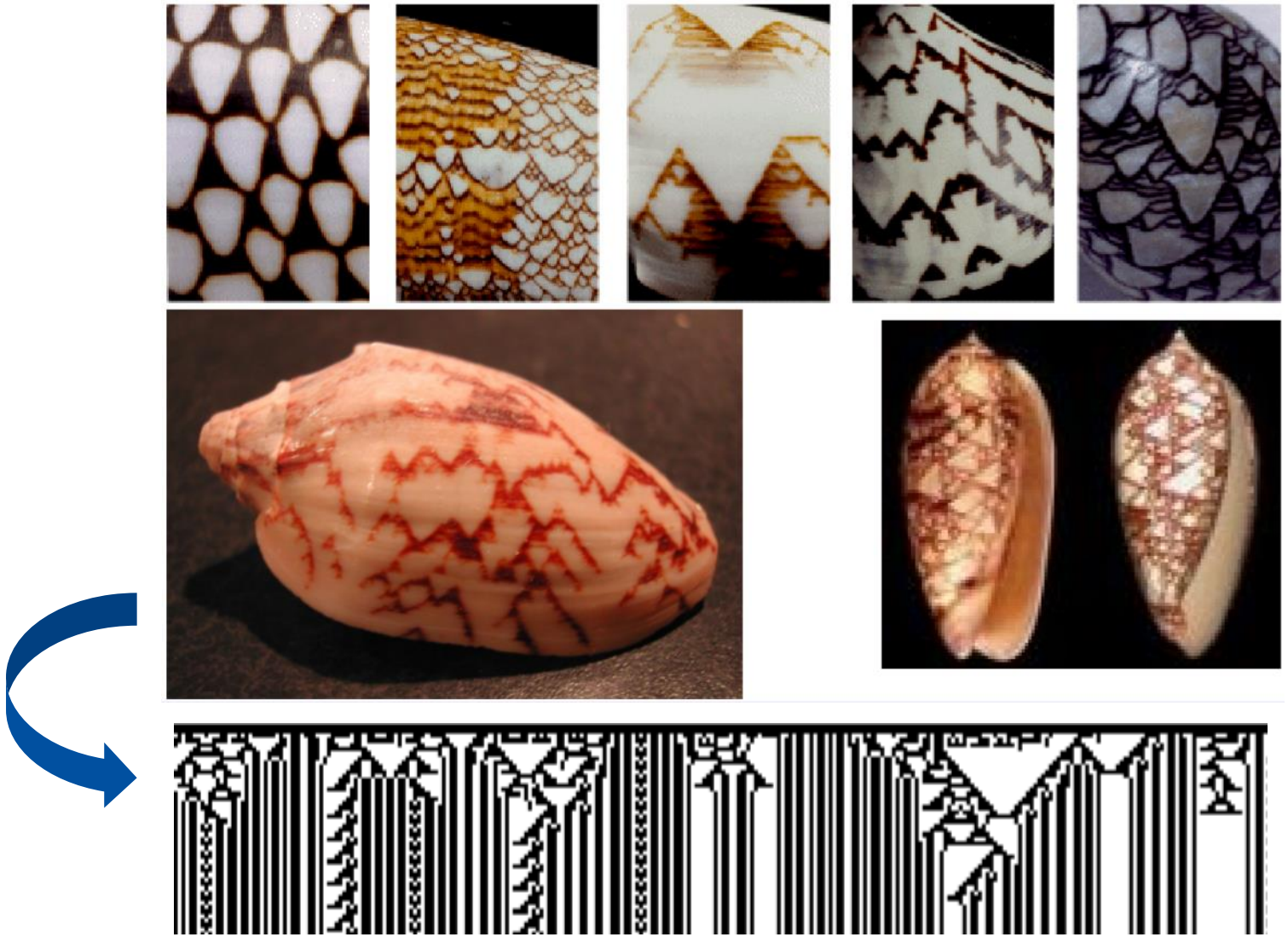
- Information processing system
  - Deterministic
  - Discrete in space, time and value
- NON-von-Neumann computers
- Study of the phenomenon of life
  - Complex structures from simple rules

# Motivation



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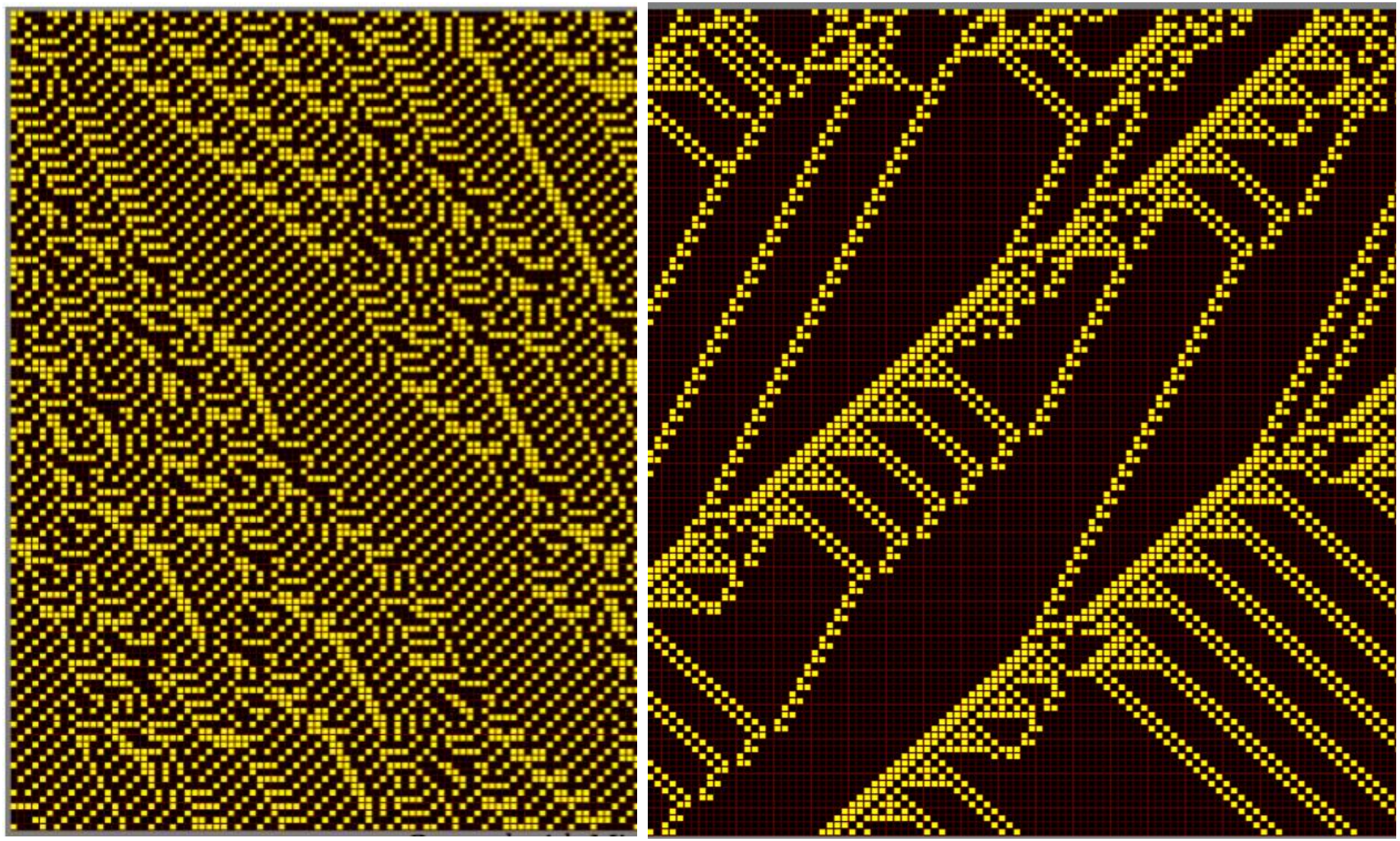

*Created with*
***Mirek's Celebration***
***CA** Simulator*

# Related Work

- **VON NEUMANN, John.**
  Theory and organization of complicated automata.
  *Burks (1966)*, 1949
- **BURKS, Arthur W.** *Von Neumann's self-reproducing automata*.
  MICHIGAN UNIV ANN ARBOR LOGIC OF COMPUTERS GROUP, 1969.
- **WOLFRAM, Stephen.** Statistical mechanics of cellular automata.
  *Reviews of modern physics*, 1983, 55. Jg., Nr. 3, S. 601.

# WHAT is a Cellular Automaton?

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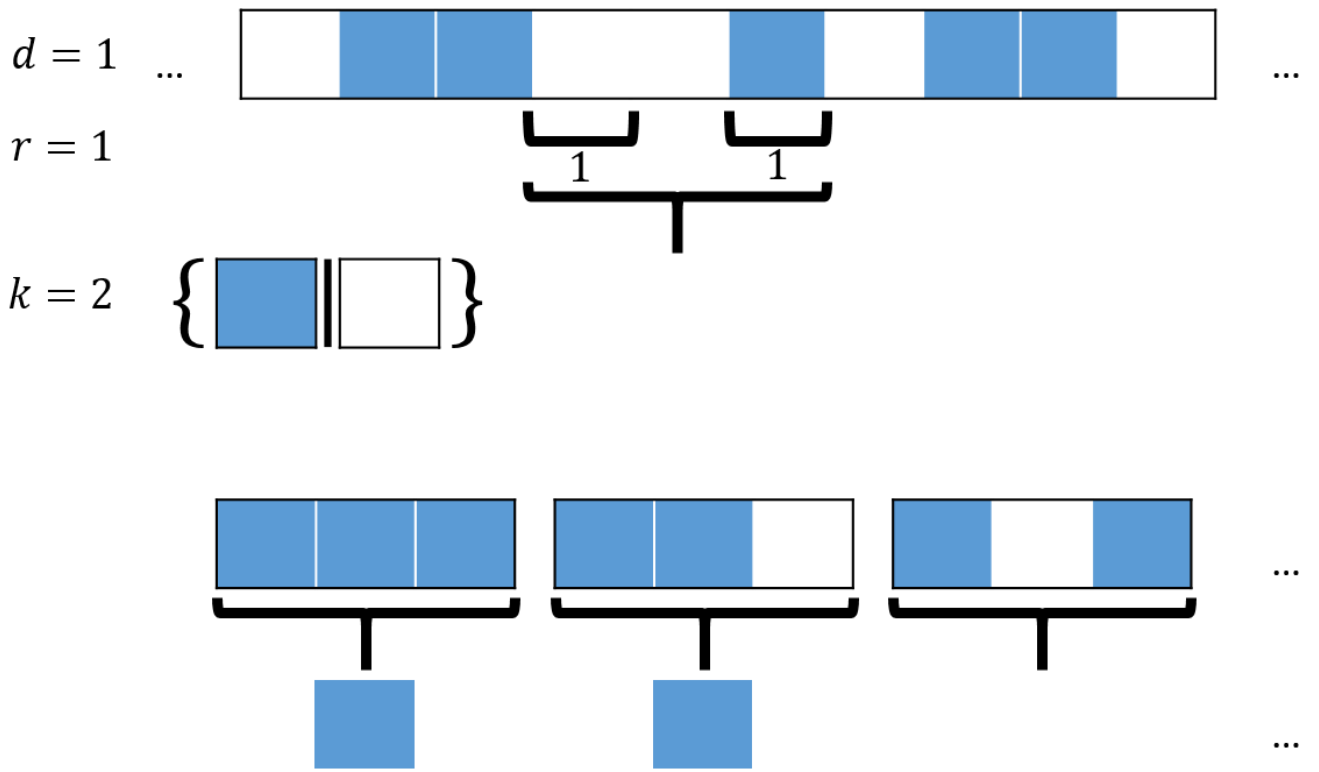
## CA

- Grid of cells (dimension **d**)
- Neighborhood (radius **r**)
- Finite set of **k** states
- Initial state
- Transformation rule

## Example



# HOW do Cellular Automata work?

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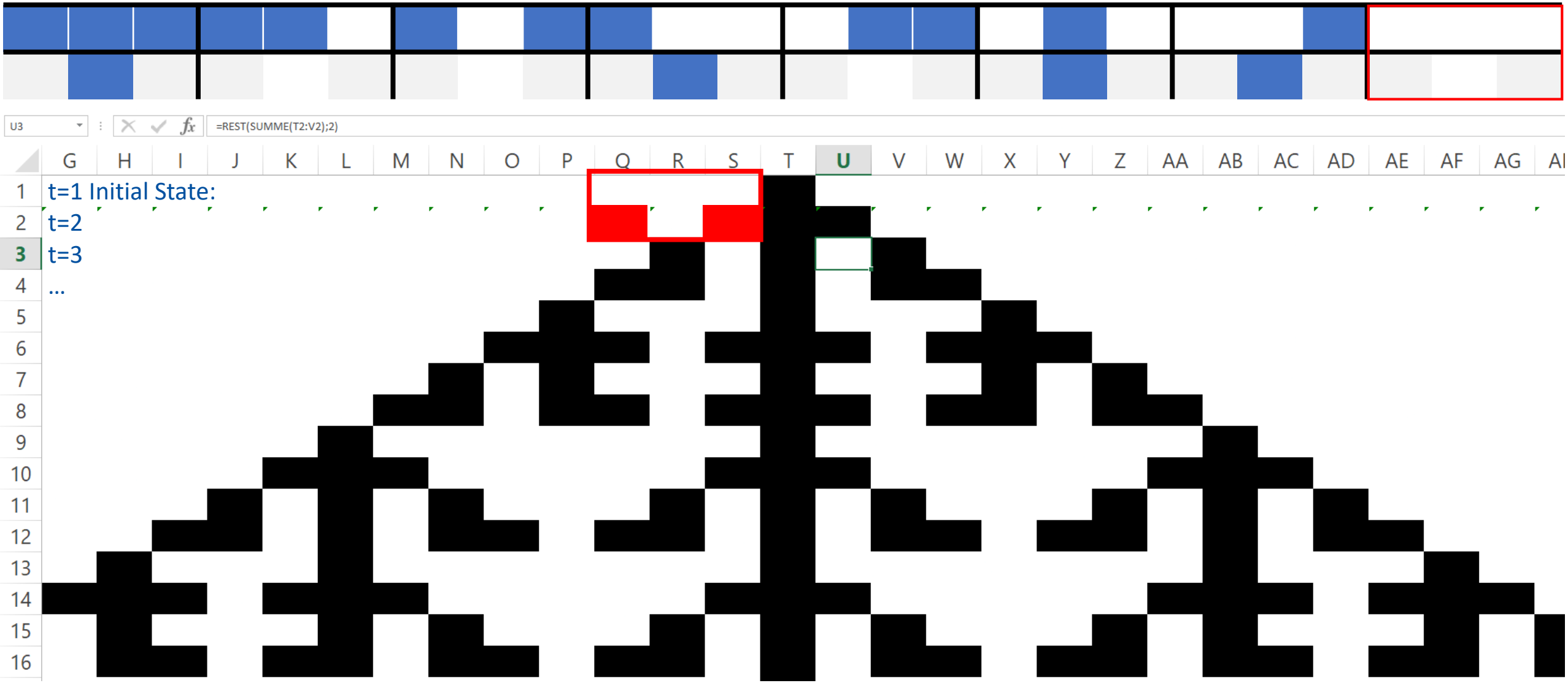

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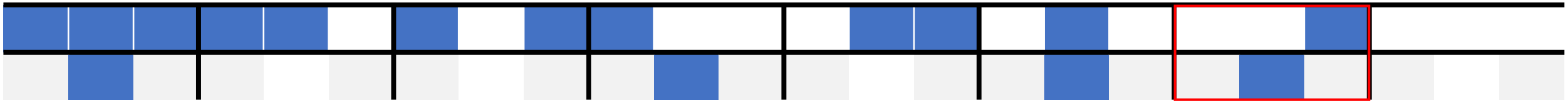

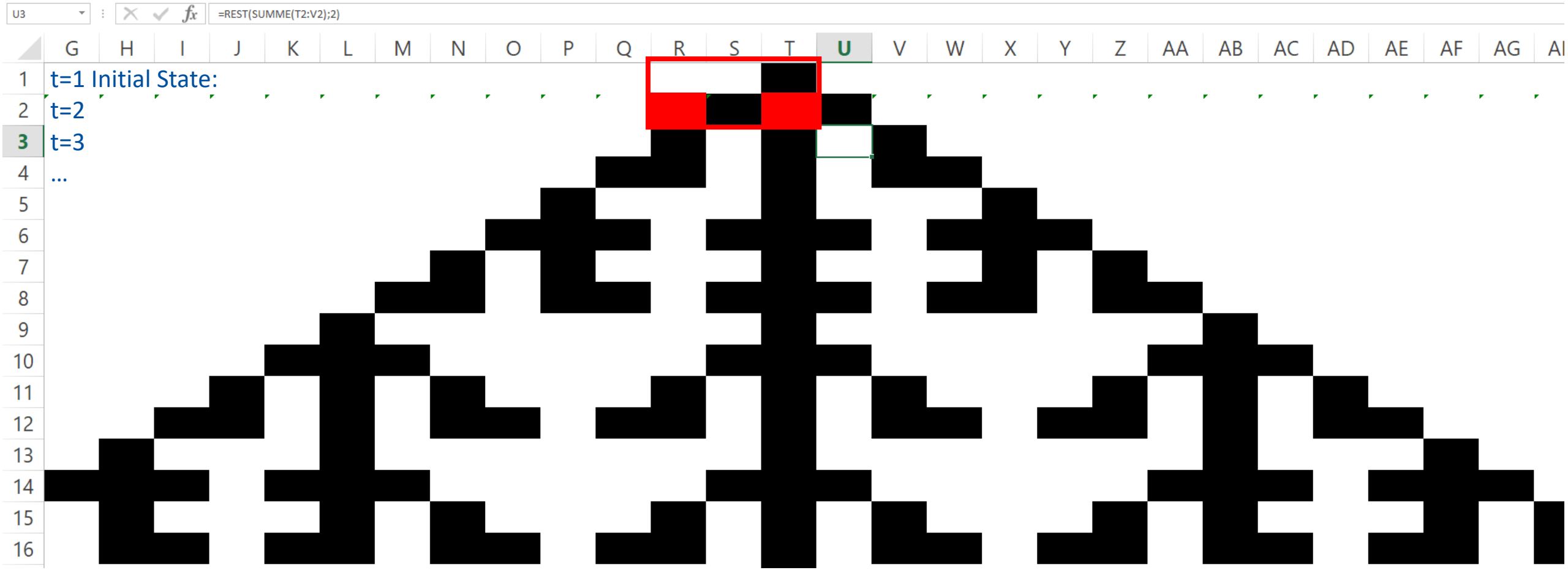

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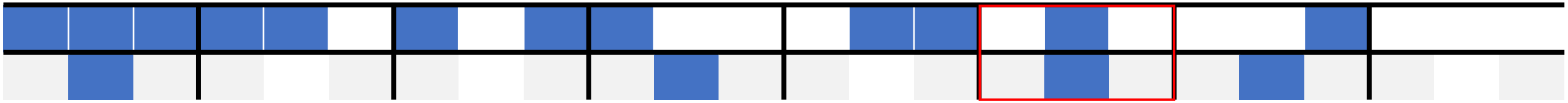

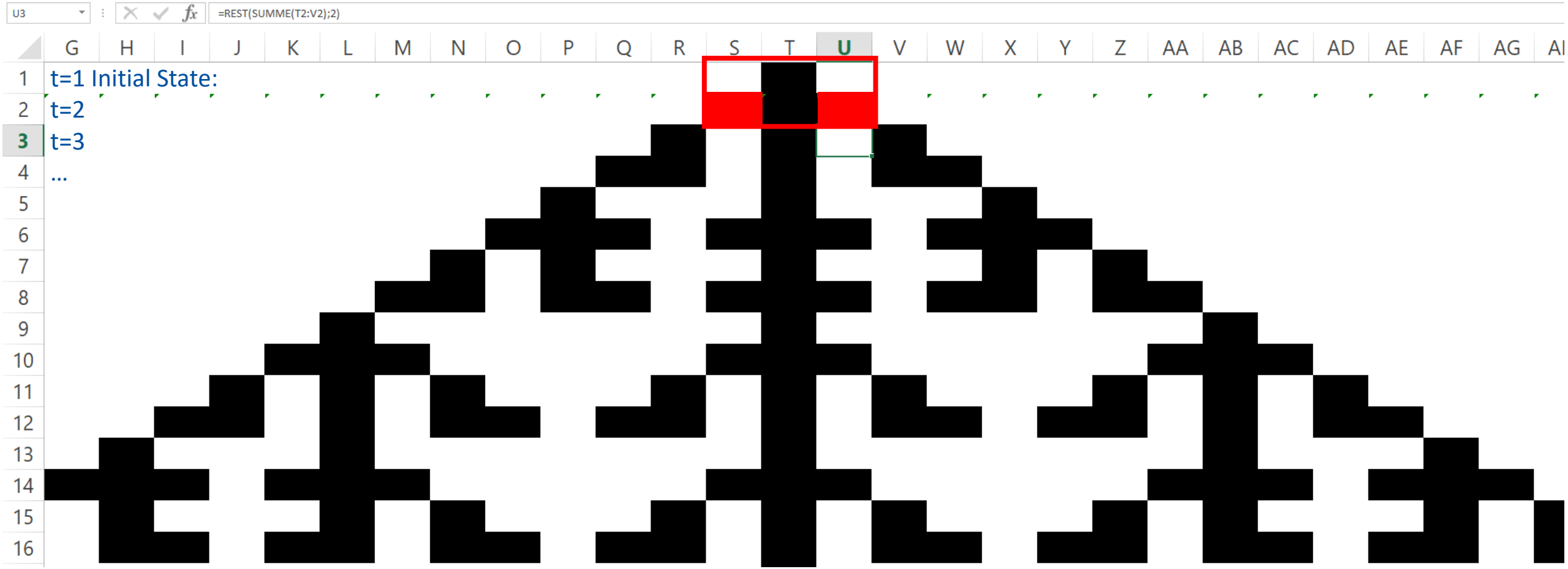

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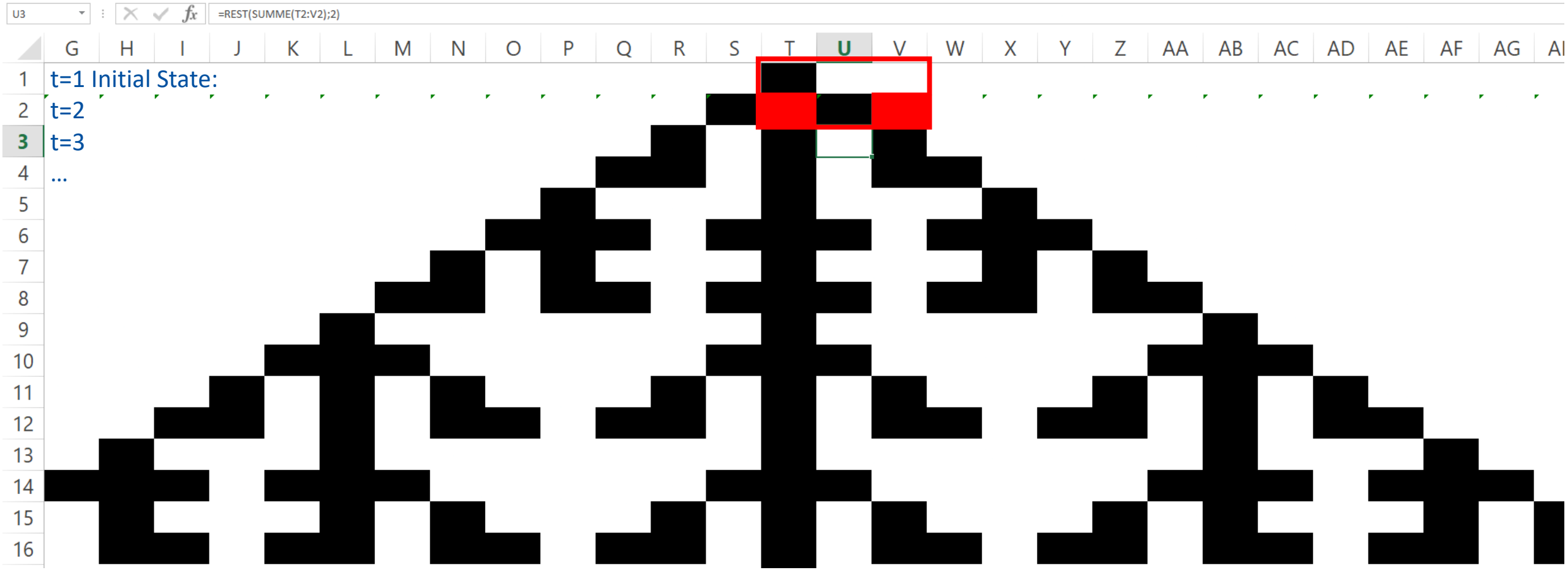

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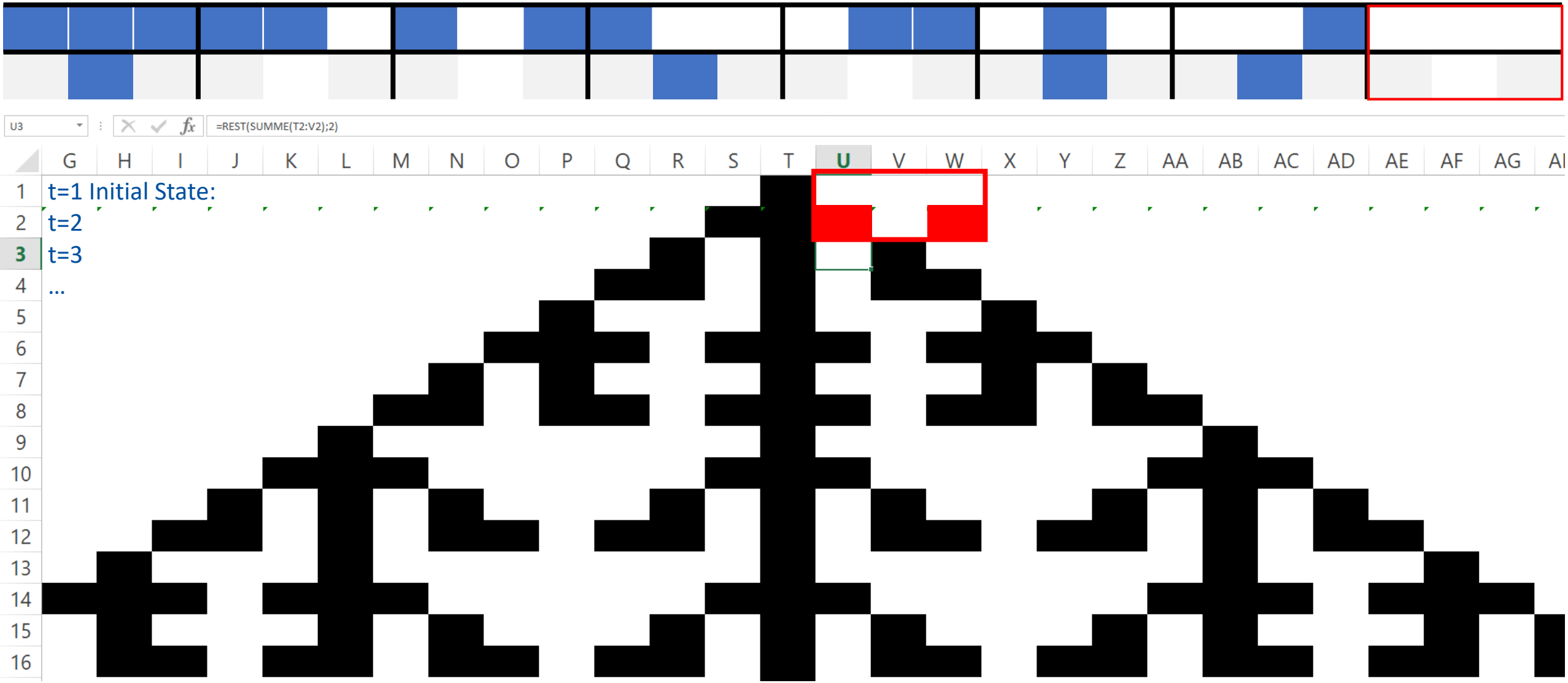

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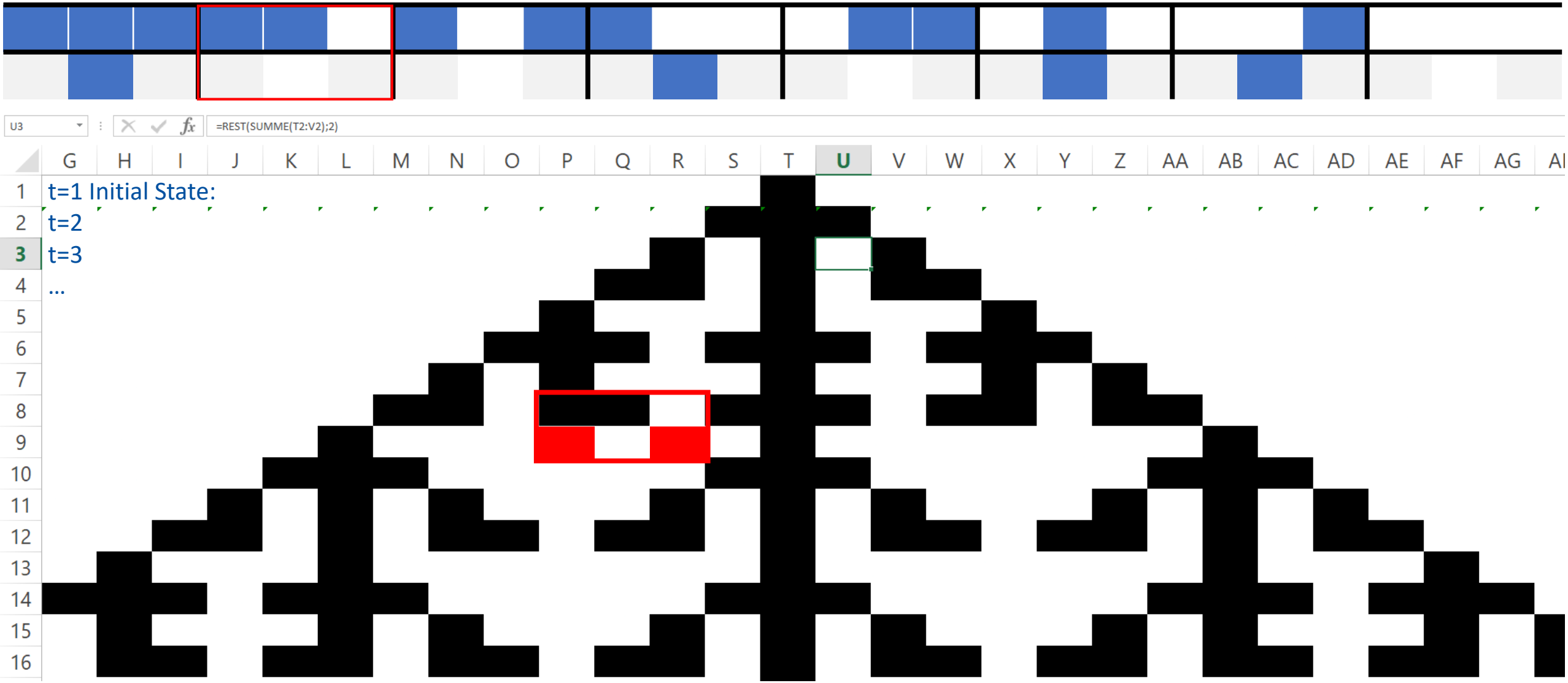

# Future work

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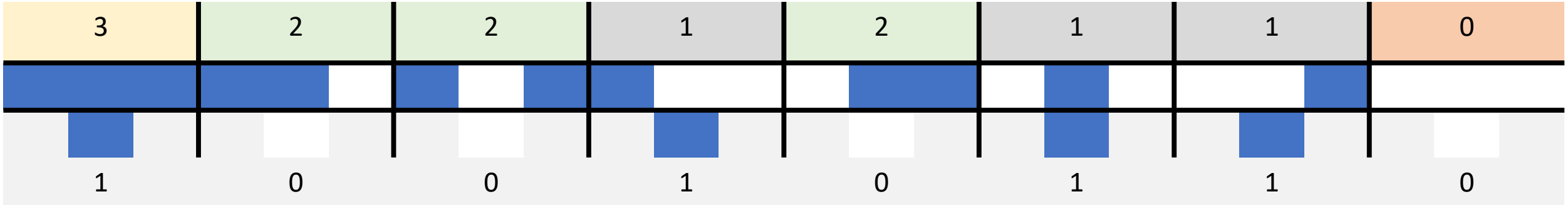
- Properties of Transition rules:
  - Silent state
  - Symmetric rule
  - Legal rules
  - Peripheral rules
  - Totalistic rules
- Wolfram number
- Properties of behaviour:
  - Homogeneous
  - Periodic
  - Chaotic
  - Self Organization
- Settings for borders



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# Thank you for your attention!

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