

Cellular Automata

Dead or Alive?

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01.12.2011



Speech overview

- 1 Introduction and theory
- 2 Inanimate algorithms
- 3 Undead species
- 4 Conclusion



What is CA?

- Grid of cells (limited, unlimited, self-closed)
- Boolean or a Łukasiewicz logic
- Conversion rule (Sleep/Born)
- Speed of any object $v = \frac{\max(\Delta|x|, \Delta|y|)}{n} c$



Łukasiewicz logic

- Implication: $F \Rightarrow (x, y) = \min\{1, 1 - x + y\}$
- Equivalence: $F \Leftrightarrow (x, y) = 1 - |x - y|$
- Negation: $F^\neg(x) = 1 - x$
- Weak Conjunction: $F \wedge (x, y) = \min\{x, y\}$
- Weak Disjunction: $F \vee (x, y) = \max\{x, y\}$
- Strong Conjunction: $F \otimes (x, y) = \max\{0, x + y - 1\}$
- Strong Disjunction: $F \oplus (x, y) = \min\{1, x + y\}$

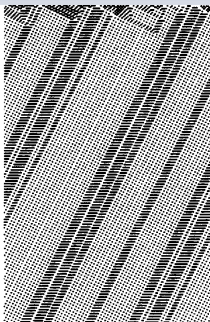


Kinds of CA

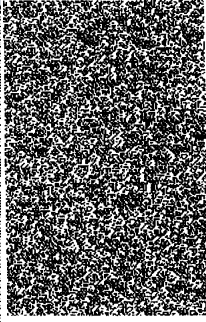
Wolfram's classification scheme



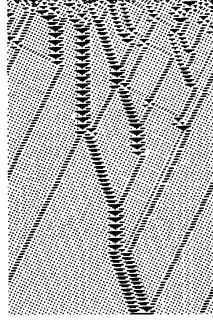
Tfida I



Tfida II



Tfida III



Tfida IV



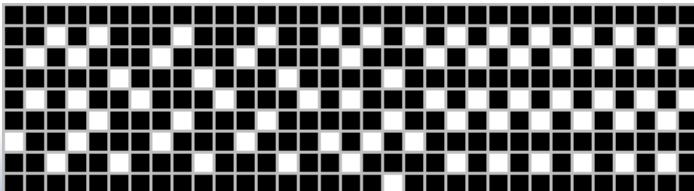
Moore-Myhill theorem

Possible states of any CA is m^n

m is possible states of one cell;

n is count of cells

The Garden of Eden - parentless pattern



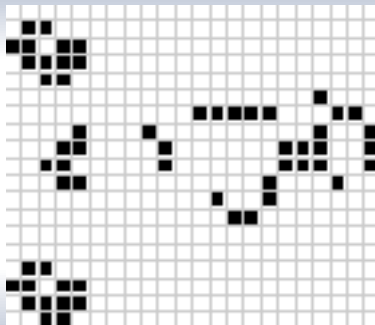
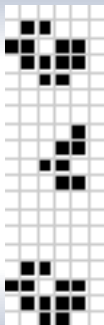


Gosper's glider gun





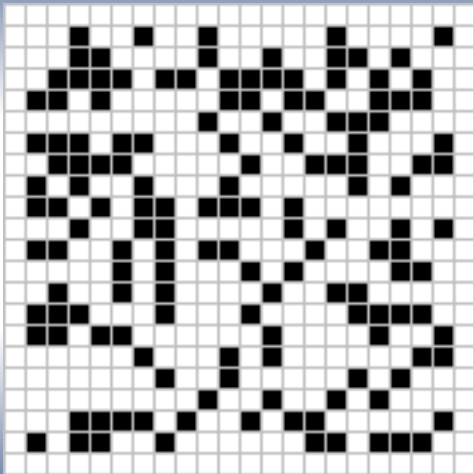
Puffer train





Undead species

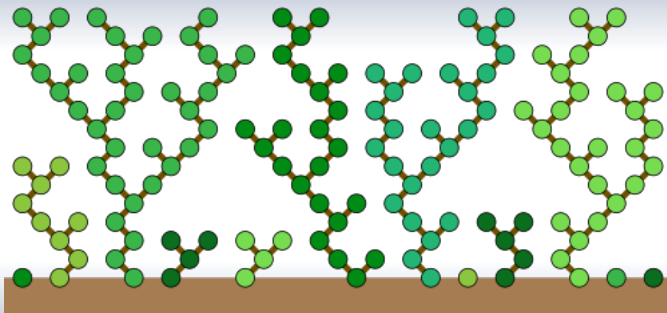
Conway's Game of Life





Undead species

Rule 90





Undead species

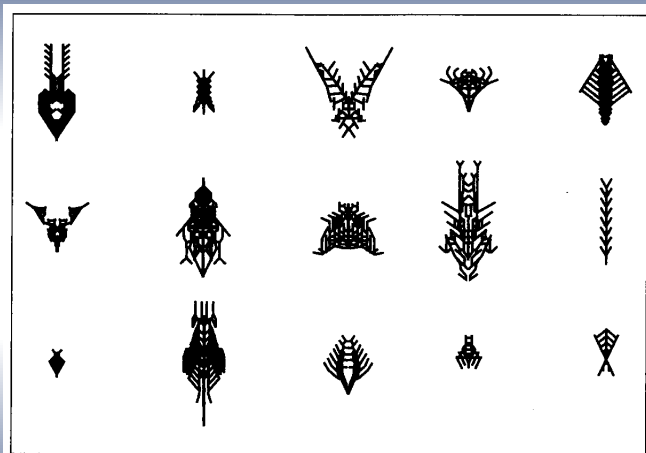
Dawkin's biomorphs





Undead species

Dawkin's biomorphs



Obrázek 8.2 / Pěstování rozmanitosti v počítači. Dawkinsovy biomorfy.



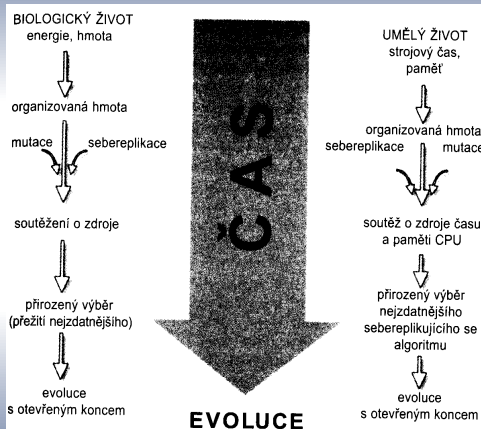
Undead species

Karl Sims





Comparison of real and virtual life





Conclusion

Conclusion

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