Instituto Politécnico Nacional

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Artificial Life Robotics Laboratory

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3D Cellular Automata And Pentominos

Simulations and configurations

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Contents

1   Brief summary

1.1   Pentominos

For more information, please consult [1]–[3].

A polyomino is a finite collection of orthogonally connected cells; or, in another workds, a collection of equally-sized squares that form a connected piece, meaning that each square can reach any other in it by going through adjacent squares; the order of a polyomino is the number of squares used to make it, so a fifth order polyomino (made of five squares), is called pentomino. Both terms, polyomino and pentomino were first used by S. Golomb in 1953, in a talk to the Harvard Mathematics Club and a year later in an article. There are twelve distinct pentominoes (see Figure 1) and two naming conventions, in this paper the Conway convention (using letters O through Z) will be used; although the resemblance to the letters with this labeling scheme seems a little more strained with the other scheme, specially when using the O instead of I, it has the advantage that uses 12 consecutive letters; also, the Conway scheme tends to be used when discussing topics related to cellular automata.
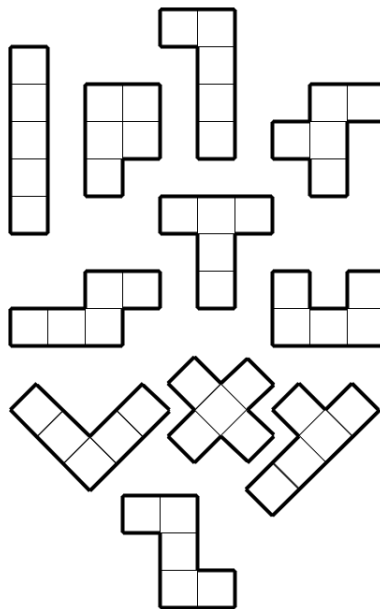
Figure 1: Conway pentominoes from O through Z (left to right).

1.1.1 R-Pentomino

1.2 Cellular Automata

Hey, there! We are talking about cellular automata. Basic structures and some well acquainted rules.

1.3 Well known configurations

Hey, there! We are talking about pentominos. Basic structures and how Conway used them to find basic configurations in the elemental automata.

1.3.1   Still Life

1.3.2   Oscillator

1.3.3   Glider

1.3.4   Glider Gun

REMARK WHY ARE THEY SO IMPORTANT AND THAT WE ARE LOOKING FOR ONE.

2   Experiment Results

2.1   The Settings

Talk about the settings for the simulation, the simulator used and the constrains (equipment, time, etcetera).

2.2   Pentomino By Pentomino

Here we talk about how the results will be exposed, for each pentomino it was done a simulation with the pentomino pasted with it-self? Remark that the pentominos are ordered in alphabeticall order and only the intial and final configurations will be shown, ergo, the appendix contains the complete evolution of each pentomino.

2.2.1 Pentomino O

2.2.2 Pentomino P

2.2.3 Pentomino Q

2.2.4 Pentomino R

2.2.5 Pentomino S

2.2.6 Pentomino T

2.2.7 Pentomino U

2.2.8 Pentomino V

2.2.9 Pentomino W

2.2.10   Pentomino X

2.2.11   Pentomino Y

2.2.12   Pentomino Z

2.3   Configurations found

Here we talk about the configurations found.

3   Conclusion

Talk about the configurations found (yayy), why it is important to find a glider gun (then, they would have "cómputo universal").

References

[1] "Lecture notes on computer science theoretical computer science and general issues," in. Springer, Mar. 2014, vol. 8370, ISBN: 9783319049205. [Online]. Available: `https : / / books . google . com . mx / books ? id = dBW6BQAAQBAJ & printsec = frontcover#v=onepage&q&f=false`.

[2] *Polyomino*, 2019. [Online]. Available: `http://www.conwaylife.com/wiki/Polyomino`.

[3] M. E. Coppenbarger, *Pentominoes - introduction*, 2019. [Online]. Available: `https://people.rit.edu/mecsma/Professional/Puzzles/Pentominoes/P-Intro.html`.

Appendices

A Full Pentomino Evolution

Below are the full evolutions of each pentomino.

A.1 Pentomino P

A.2 Pentomino Q

A.3 Pentomino R

A.4 Pentomino S

A.5 Pentomino T

A.6 Pentomino U

A.7 Pentomino V

A.8 Pentomino W

A.9 Pentomino X

A.10 Pentomino Y

A.11 Pentomino Z