

Graphical Pond Generator Model

Institute of Computer Science of University of Tartu

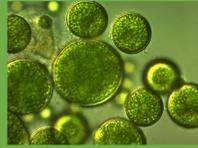


Konstantin Merkulov
University of Tartu, Software Engineering
Merkulov@ut.ee



Idea: Andre Säask.

Development: Konstantin Merkulov



Objective

The main objective of this software is to develop a program that will help fishermen and farmers involved in fishing to calculate the optimal lake size and number of fish for further breeding and rearing crucians and luses. The program has the following four roles: rock, seaweed, crucian, and luce.

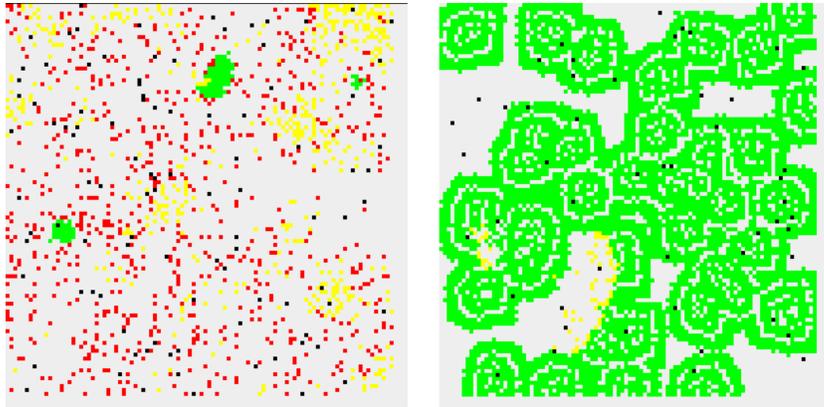


Figure 1. Graphical pond generator model.

Conway's Game of Life invention

John Horton Conway (26 December 1937 – 11 April 2020) was an English mathematician active in the theory of finite groups, knot theory, number theory, combinatorial game theory and coding theory [6]. In 2017 Conway was given honorary membership of the British Mathematical Association [6].



Founder: John Conway

He also made contributions to many branches of recreational mathematics, most notably the invention of the cellular automaton called the Game of Life [6].

John Horton Conway, was a legendary Cambridge mathematician who stood out for his love of games and for bringing mathematics to the masses [6].

He died on Saturday, April 11, in New Brunswick, New Jersey, from complications related to COVID-19 [6]. He was 82 [6].

Introduction

To design the pond model, we use a two-dimensional array that contains objects from four different classes: rock, seaweed, crucian, and luce. Each subsequent class inherits the properties of the previous class. The „rock“ class has coordinates, the „seaweed“ class has the addition of lifespan and growth rate and the method of new algae birth (for simplicity, seaweed can reproduce by division in the model). Crucian has the method of eating seaweed. Luce is practically identical to crucian, but they eat crucian instead of seaweed and must be smarter than crucians. Wisdom is determined by how a decision is made for each subsequent step. This is called a cellular automaton, and the original inventor of this idea is John Conway [1].

Cellular automaton

A cellular automaton is a discrete model, that is useful to abstract computational systems that have proved useful both as general models of complexity and as more specific representations of non-linear dynamics in a variety of scientific fields [1]. Automata theory is the study of abstract machines and automata, as well as the computational problems that can be solved using them. It is a theory in theoretical computer science [2].



Figure 2. Cellular automaton. Sources [3,4].

Motivation

The Pond model application idea was taken from the web application course by lecturer Andre Säask. This topic seemed very interesting for participating in the competition of student projects, and it is also useful for beginner anglers, to motivate them with a good catch, and visualize an approximate picture of a graphical pond model to visualize an approximate catch.

Conway [6] chose his rules carefully, after considerable experimentation, to meet Game of Life criteria:

- There should be no explosive growth.
- There should exist small initial patterns with chaotic, unpredictable outcomes.
- The rules should be as simple as possible, whilst adhering to the above constraints [6].

Future work

In the future this program needs to be overwritten into the JavaFX. At the moment we use java awt and swing, and it does not allow us to give a better design.

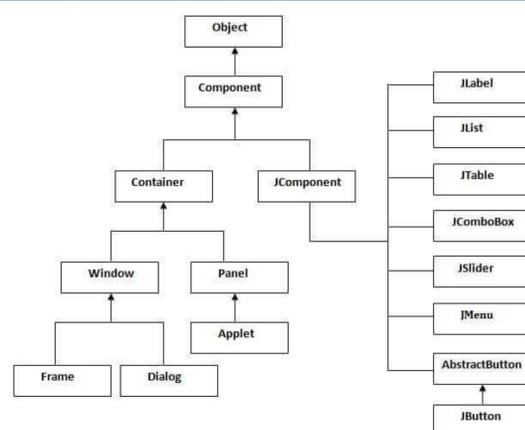


Figure 3. Hierarchy of Java Swing classes. Source [5].

References

- [1] Berto, Francesco, and Jacopo Tagliabue. 2017. "Cellular Automata." In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, Fall 2017. Metaphysics Research Lab, Stanford University. <https://plato.stanford.edu/archives/fall2017/entries/cellular-automata/>.
- [2] "Automata Theory." 2020. In Wikipedia. https://en.wikipedia.org/w/index.php?title=Automata_theory&oldid=953769350.
- [3] Sagado. 2019. "Conway's Game Of Life in Blender." Medium. April 26, 2019. <https://www.dailymotion.com/conway-game-of-life-in-blender-6068602214>.
- [4] "Cellular Automata." n.d. Confluence. Accessed May 22, 2020. <https://www.javatpoint.com/blog/cellular-automata/>.
- [5] www.javatpoint.com. "Java Swing Tutorial - Javatpoint." Accessed May 23, 2020. <https://www.javatpoint.com/java-swing>.
- [6] "John Horton Conway." In Wikipedia, May 21, 2020. https://en.wikipedia.org/w/index.php?title=John_Horton_Conway&oldid=958050292.